No. 8187

JVC Service Manual

VIDEO CASSETTE RECORDER VHS PAL

MODEL HR-2200E

TUNER/ADAPTER

MODEL TU-22E

AC POWER ADAPTER

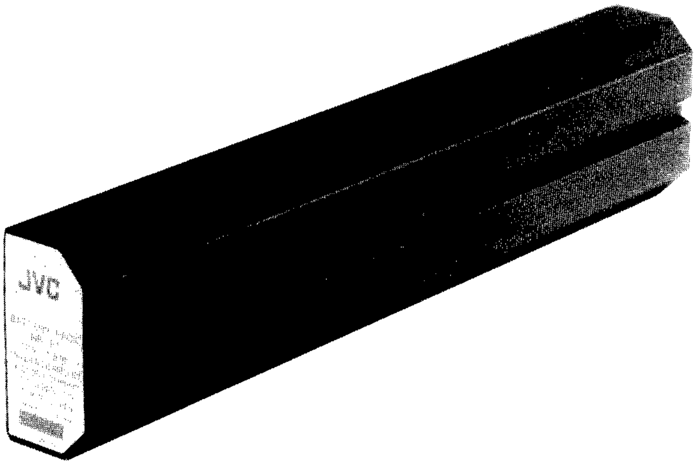
MODEL AA-P22E

VICTOR COMPANY OF JAPAN, LIMITED

JVC

NB-P1 BATTERY PACK

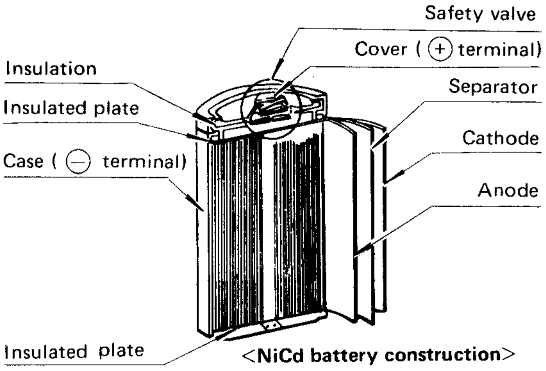
TECHNICAL NOTES



The NB-P1 is a specially fabricated nickel-cadmium (Nicd) battery pack for use with the JVC HR-2200E VHS portable video cassette recorder.
In comparison to a lead-acid type battery, a NiCd battery offers many advantages for use in portable video equipment. At the same time, however, certain precautions are required in order to ensure optimum performance and safety.
For this reason, please read the following description and take a few moments to instruct the customer on the proper use and handling of the NB-P1.

1. CONSTRUCTION AND PRINCIPLE

1) Fig. 1 shows the basic construction of a NiCd battery. Anode and cathode plates are spaced by a separator and wound in a spiral, then inserted into the case. After inserting the electrolyte, the case is sealed.
2) A NiCd battery uses an oxynickel hydroxide (2NiOOH) anode, a cadmium (Cd) cathode and potassium hydroxide (KOH) electrolyte. The electrochemical reaction for charging/discharging is shown in Fig. 1.



<NiCd battery construction>

$$2NiOOH + 2H_2O + Cd \underset{\text{Charge}}{\overset{\text{Discharge}}{\rightleftarrows}} 2Ni(OH)_2 + Cd(OH)_2$$

Fig. 1

2. BATTERY PACK CONSTRUCTION

The NB-P1 is composed of 10 NiCd cells spot welded with nickel plating. Also included are a fuse, a thermal fuse and a thermostat (48°C), which detects the battery temperature and controls charging. The external package is composed of heat resistant and flame retardant plastic.

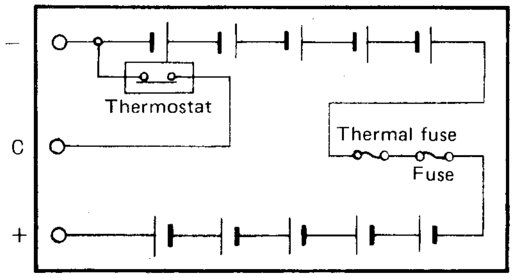


Fig. 2

Notes:
1. Since heat is produced in the recharging process, the temperature of the external case rises shortly after completion of charging. This is normal.
2. Electrode construction of the NB-P1 provides durability against over-charging.
3. Do not open the battery and do not attempt to repair or modify it.

3. HANDLING CAUTIONS

- Be sure to charge the battery pack before using it the first time.
  Use only the TU-22E or AA-P22E to perform charging and recharging.
- Do not short the battery terminals.
  A NiCd battery possesses low internal resistance and if short-circuited, the sudden large current flow poses a hazard.
  At the same time, opening of the internal fuses will render the battery useless.
- Do not expose to water or fire.
  The battery becomes nonfunctional when immersed in water. If incinerated or exposed to fire, internal gasses may cause an explosion hazard.
- Again, we emphasize: do not open the battery or attempt to modify it.

4. USAGE NOTES

The following problems are occasionally encountered when customers use the battery pack.

Complaint	Reference
1. New battery cannot be used.	Not charged before initial use The NB-P1 is not charged before shipping from the factory. Thus a new battery pack must be charged before using it.
2. Battery can be used only for a short time. It does not charge fully until after 2 or 3 charge/discharge cycles. (Excluding over-life battery.)	1. Not charged before initial use Self-discharging rate is rather high with this type of battery. For best reliability perform charging at times as close as possible prior to important taping sessions. 2. Stand-by mode operation too long When connected in a system in the E-E mode (camera and HR-2200E electronics working, but recording not in progress), current is consumed even during the Stop and Pause modes. Thus, if stand-by is used extensively, the actual recording time becomes shortened. Example: The combination of HR-2200E + GX-33E, (or GX-66E) can be operated for about 60 minutes per charge. However, if there is a 2 : 1 ratio between the time for setting the camera angle and recording, only about 20 minutes becomes left for actual recording. 3. Camera power consumption high The power consumption of the camera (and electronic viewfinder, if used) strongly influences the recording time. Some examples of equipment combinations and approximate continuous recording times are as follows. HR-2200E + GX-33E (or GX-66E) . . . . 60 minutes HR-2200E + GX-66E + VF-P30E . . . . 50 minutes HR-2200E + GC-4100E . . . . 35 minutes 4. Charging under high temperature The discharge time (useful operating time) becomes appreciably shortened when the battery is charged in the presence of temperatures above 35°C (95°F). Therefore, for best results, perform charging in a temperature range of 10°C to 35°C (50°F to 95°F). One effect of charging at high temperature is temporary reduction of charging capacity. However, when returned to normal temperature, the original charge/discharge response is also returned. Nevertheless, continuous operation at high temperature will deteriorate the battery. 5. Long storage periods In a multicell battery pack, there are unavoidable differences in the self-discharge rates of the individual cells. After long storage in a charged state, a low-charged cell can reverse polarity when the battery is used. In this event, 2 or 3 cycles of charge/discharge are required to return to normal storage capacity. Example: After 3 months storage, a battery may be able to hold only 70% of capacity with one charging. In this case, the typical 60 minutes of operation becomes reduced to about 40 minutes.
3. Battery heats up directly after charging.	This is normal due to the temperature detection type of charging system. However, it is advised not to place the battery in an insulated type of case (such as styrofoam) immediately after charging. Allow sufficient time for the internal heat to dissipate.

REFERENCE DATA

1. CHARGING RESPONSE (CHARGING TIME VS. TEMPERATURE)

1) Perform charging in a temperature range of 10°C to 35°C (50°F to 95°F). Below 10°C (50°F), there is risk of over-charging and battery deterioration.
2) When used according to instructions, recharging time with the AA-P22E is about 90 minutes.

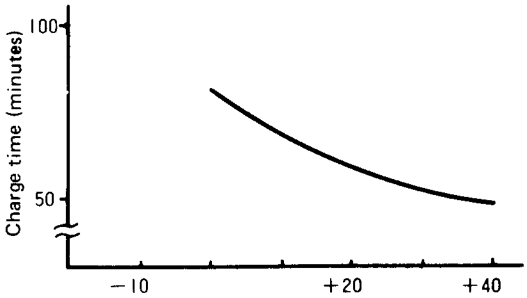


Fig. 3

2. DISCHARGE RESPONSE (TIME VS. TEMPERATURE)

1) Use battery in a temperature range of −10°C to 40°C (+14°F to +104°F).
2) Fig. 4 shows the discharge curve when the NB-P1 is charged at 25°C(77°F)and used with the HR-2200E + GX-33E (or GX-66E) combination.
3) Discharge time also varies according to the connected camera. In addition, the time becomes shortened at low temperatures.

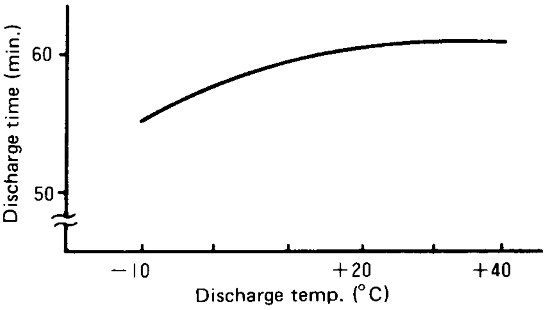


Fig. 4

3. DISCHARGE TIME VS. CHARGING TEMPERATURE

1) Discharging time of a NiCd battery is strongly governed by the temperature at the time of charging. At high temperatures, oxygen gas is liberated more quickly and limits the effective charging capacity.
2) The Fig. 5 curve shows the discharge (continuous operating) time versus charging temperature for the combination of NB-P1 and HR-2200E + GX-33E (or GX-66E).

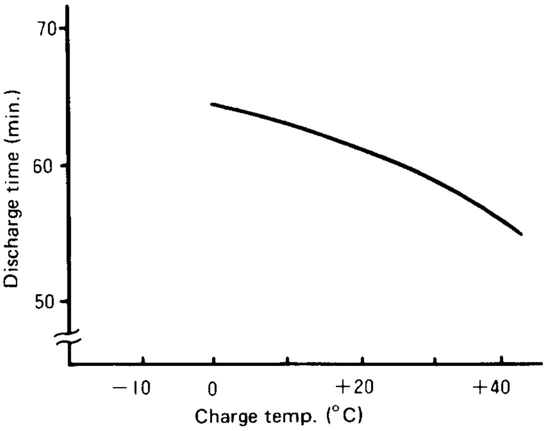


Fig. 5

4. CONTINUOUS OPERATION

An example of the discharge current versus the discharge time is shown in Fig. 6. In the case of the HR-2200E + GX-33E (or GX-66E) combination, this becomes about 60 minutes.

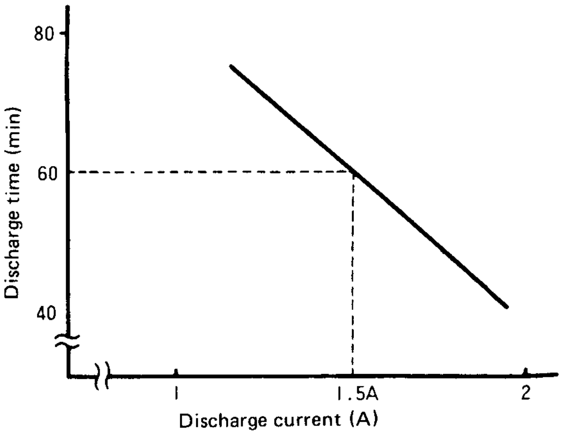


Fig. 6

5. STORAGE TEMPERATURE VS. DISCHARGE

1) Use the battery to discharge it before storing for an extended period of time. When the battery is stored in the discharged state, its charge/discharge characteristics tend to return to normal more quickly than one stored in a charged state.
2) Store the battery pack in a dry location with a temperature range of −10°C to +30°C (+14°F to + 86°F).
3) Note that the self-discharging characteristics of a NiCd battery are somewhat less favorable than those of a lead-acid battery.
4) After long storage, 2 or 3 charge/discharge cycles are required to return to normal storage capacity.

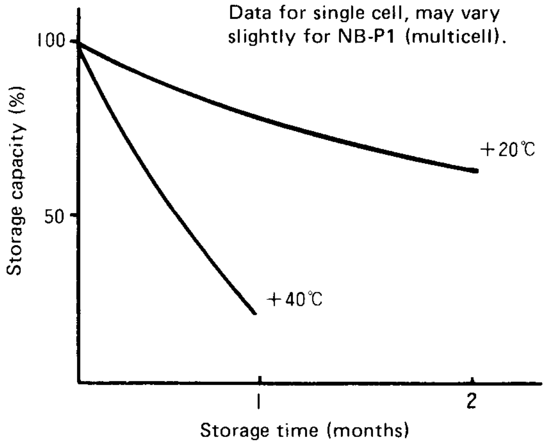


Fig. 7

6. LIFE (CHARGE/DISCHARGE CYCLES)

1) Battery life is strongly influenced by conditions of use (ambient temperature, discharge depth, usage frequency, etc.).
2) When used according to instructions under normal conditions, a life of over 300 to 500 cycles can be expected.

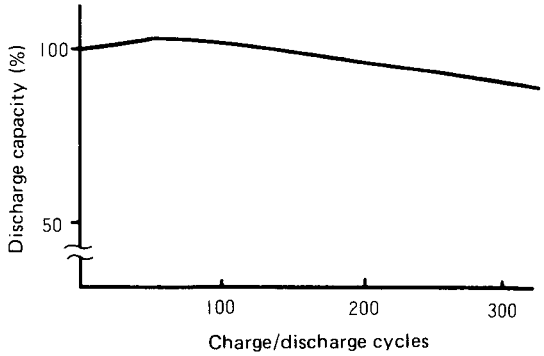


Fig. 8

Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

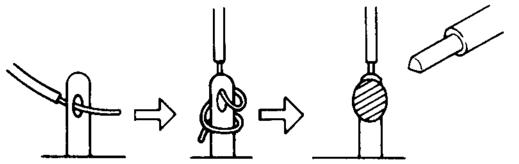


Fig. 1

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

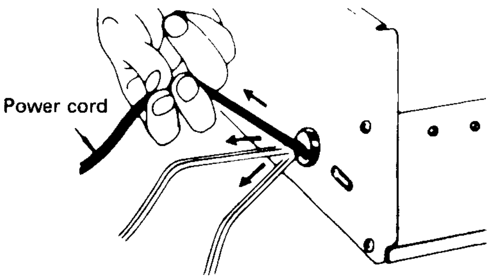


Fig. 2

9. Also check areas surrounding repaired locations.

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the specified parts. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector
    In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.
    1) **Connector part number :** E03830-001
    2) **Required tool :** Connector crimping tool of the proper type which will not damage insulated parts.
    3) **Replacement procedure**
       (1) Remove the old connector by cutting the wires at a point close to the connector.
       Important : Do not reuse a connector (discard it).

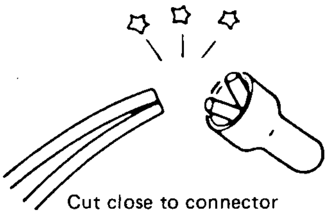


Fig. 3

(2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.

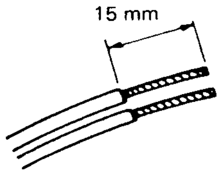


Fig. 4

(3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.

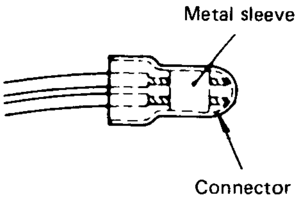


Fig. 5

(4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.

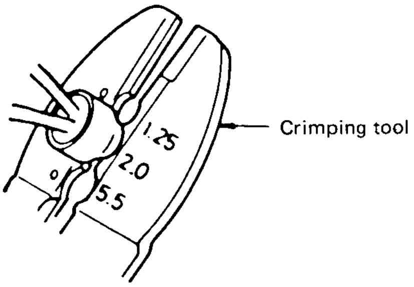

1.25
2.0
5.5
Crimping tool

Fig. 6

(5) Check the four points noted in Fig. 7.

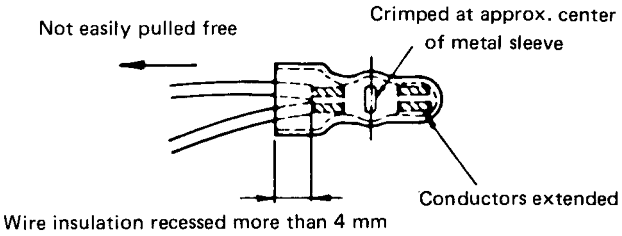

Not easily pulled free
Crimped at approx. center of metal sleeve
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

• Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions, Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**
   Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.
2. **Dielectric strength test**
   Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.
3. **Clearance distance**
   When replacing primary circuit components, confirm specified clearance distance (d), (d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

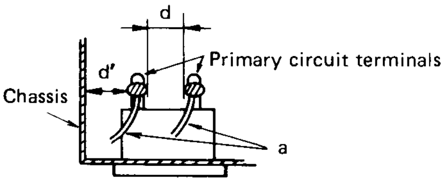

d
d'
Primary circuit terminals
Chassis
a

Fig. 8

4. **Leakage current test**
   Confirm specified or lower leakage current between B (earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

   Measuring Method: (Power ON)
   Insert load Z between B (earth ground, power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

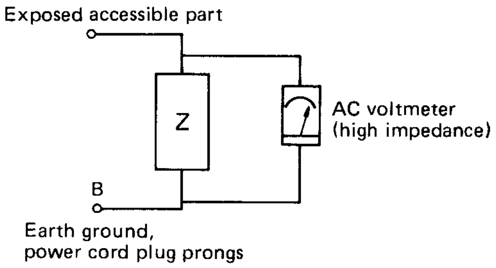

Exposed accessible part
Z
AC voltmeter
(high impedance)
B
Earth ground,
power cord plug prongs

FIg. 9

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance (d), (d')
100 V	Japan	≧ 1 mΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	–	900 V 1 minute	≧ 3.2 mm
*110 to 130 V 200 to 240 V	Europe Australia	≧ 10 mΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

*Class II model only.

Table 1 Ratings for selected areas

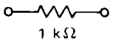
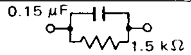
AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (b) to:
100 V	Japan	 1 kΩ	i ≦ 1 mA rms	Exposed accessible parts
110 to 130 V	USA & Canada		i ≦ 0.5 mA rms	Exposed accessible parts
110 to 130 V 220 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Other terminals

Table 2 Leakage current ratings for selected areas

Note: This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

Ultra-miniaturized "Chip" Parts

1. In place of conventional resistors and capacitors, this model uses miniature chips to perform these functions (some initial production units may contain the conventional parts). Although these contribute substantially to miniaturization of the product, certain precautions are required in their handling and replacement.
   1) Chip parts are soldered directly to the copper pattern of the circuit board. Due to their small size, tweezers and other tools suitable for handling small objects are required.
   2) For soldering, use a thin, high insulation, soldering "pencil" in the 20 watt range (less than 30 watts is recommended). Perform soldering and unsoldering quickly (within 2 or 3 seconds) to avoid overheating.
   3) Removed chip parts cannot be re-used.
   4) Since ratings and values are not marked on the chip parts, use care to stock them in an orderly manner.

2. Unsoldering
   1) Use a suction type or similar desoldering tool to unsolder both ends of the chip part.
   2) Grasp chip part with tweezers and while carefully heating with the soldering pencil, remove part with a twisting motion.

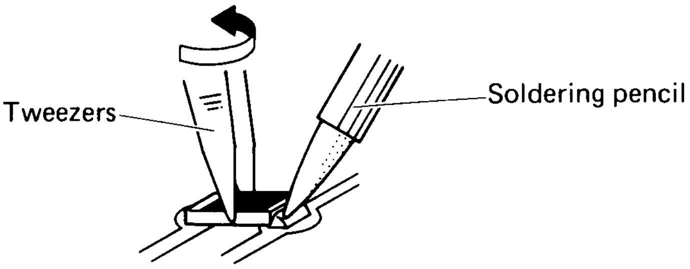


Fig. 1

3. Soldering
   1) Pre-solder the points of the pattern to which the chip part is to be mounted.
   2) Press the chip part against the circuit board and solder both ends.

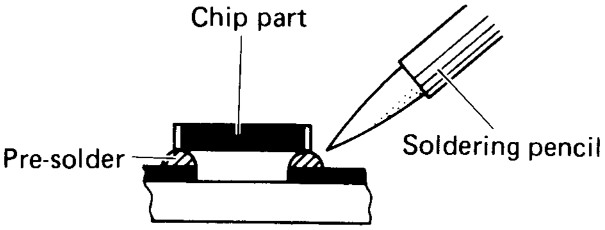


Fig. 2

4. Chip Parts Interchangeability

   As shown in Fig. 3, in some cases, chip parts can be replaced with conventional parts (holes may be present to allow insertion of part leads). Replaceable parts are as follows:

   1) Chip resistors (QRS188J-xxxT) .... 1/8 W carbon resistors (QRD187J-xxxA)
   2) Chip capacitors (QCY81HK-223K)............... 50 V mylar capacitors (QFN41HJ-223)

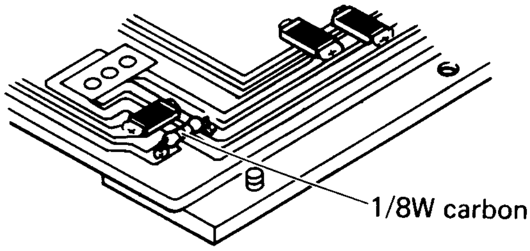


Fig. 3

No. 8187(⅓)

JVC Service Manual

JVC
VHS
COUNTER
JVC
VIDEO CASSETTE RECORDER
STOP
TAPE RUN
BATT
DEW
CAMERA
TRACKING
NORMAL
SLOW
REMOTE

MODEL HR-2200E

VICTOR COMPANY OF JAPAN, LIMITED

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SECTION 1
GENERAL DESCRIPTION

This manual provides service information for the JVC VHS Model HR-2200E.
The manual describes the principles and adjustments of mechanical and electrical operations for this model.
Service procedures given herein cover only field maintenance services.
Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at the factory.
Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.
For convenience, the text of the Instructions is reproduced on the following pages. Numbering of the pages also corresponds to the Instructions. However, the Instructions used by the customers are in English, French and German versions. The following is a reprint of only the English version.

Thank you for purchasing the JVC HR-2200EG/EK Portable Colour Video Cassette Recorder. Based on the VHS video format developed by JVC for full home-video entertainment, this unit has been designed with emphasis on its ease of operation, mobility and ruggedness as a handy portable.

Using this unit in combination with a JVC colour video camera, you can make your own video tapes in a wide variety of situations, outdoors and indoors.

To obtain the best performance and greatest utilization from your HR-2200EG/EK, read this instruction booklet completely and carefully.

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VHS

Only cassettes marked "VHS" can be used with this video cassette recorder.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This unit should be used with 12 V DC only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

CAUTION:
To prevent shock, do not open the cabinet. No user serviceable parts inside. Refer servicing to qualified personnel.

The EK-version is for use in the United Kingdom.

WARNING (For EG-version)

1. This set is for exclusive use with the PAL colour system.
   Connect a video camera built to the PAL standard.
2. SECAM colour programmes might be recorded in certain areas when this set is used in combination with a tuner unit but there is no interchangeability of these recorded cassette tapes with other PAL-VHS recorders or SECAM-VHS recorders.
3. Please use the exclusive SECAM-VHS recorder in SECAM broadcasting areas.
4. Please use only PAL prerecorded cassette tapes of PAL signals which have been recorded with the PAL-VHS system.

Note:
The rating plate (Serial Number Plate) is on the bottom of the unit.

IMPORTANT: It is permissible to record television programmes only in the event that third party copyrights and other rights are not violated.

WARNING (The United Kingdom)
Recording and playback of material may require consent. See copyright Act 1956 and Performers Protection Act 1958 – 1972.

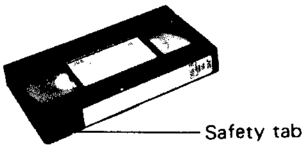
FEATURES

- Extremely compact and lightweight, easy-to-use portable recorder built to the VHS format.
- Flexible three-way power supply arrangement – exclusive Ni-Cd rechargeable battery pack, household AC and car battery.
- Feather-light touch pushbutton operation due to microprocessor-based full-logic tape control.
- Full 12-mode remote control operation.
- Newly-developed slow-motion mechanism for producing clean slow-motion pictures.
- Shuttle search for quick picture search in both directions at a speed about 10 times the normal.
- ESC (Edit Start Control) system minimizing picture distortion between separately recorded segments.
- Audio dubbing facility provided to record sound track on pre-recorded tapes.
- May be connected to most TV receivers due to the built-in RF converter.
- Tape running indicator for easy visual check of the tape running condition.
- LCD (Liquid Crystal Display) tape counter with memory function.
- Recording standby mode lock switch provided.

PRECAUTIONS

Handling and storage

- Prevent inflammables, water and metallic objects from entering the unit.
- Do not disassemble or remodel the unit, as this will cause danger and malfunctioning.
- Do not use the unit when it is lightening in the vicinity and exercise special care not to allow the unit to become wet when shooting outdoors on rainy days.
- Do not place heavy objects on the unit.
- Do not apply shocks to the unit.
- Do not subject the unit to direct sunlight or place it near a heater for a long period of time, otherwise the cabinet may become deformed or the internal electronic components such as transistors may be damaged. Pay special attention of rising temperature in closed cars on hot summer days; the temperature in closed cars sometimes reaches as high as 80°C.
- Avoid using the unit under the following conditions:
  - Extremely hot or cold places
  - Near appliances generating strong magnetic fields
  - Moving from a cold to a warm place
  - Places subject to excessive humidity, dust or vibrations



Video cassettes

- The HR-2200EG/EK employs VHS type cassettes only; E-180 for 3 hours, E-120 for 2 hours, E-60 for 1 hour and E-30 for 30 minutes of recording.
- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has been removed, use adhesive tape to block the hole.
- Do not load and unload a video cassette successively without allowing the tape to run. This may slacken or damage the tape.
- An inverted cassette cannot be inserted.
- Do not touch the tape directly.
- Do not disassemble the video cassettes.
- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or a magnet) and dusty places.
- Place the cassettes in cassette cases and position them vertically.

Operation

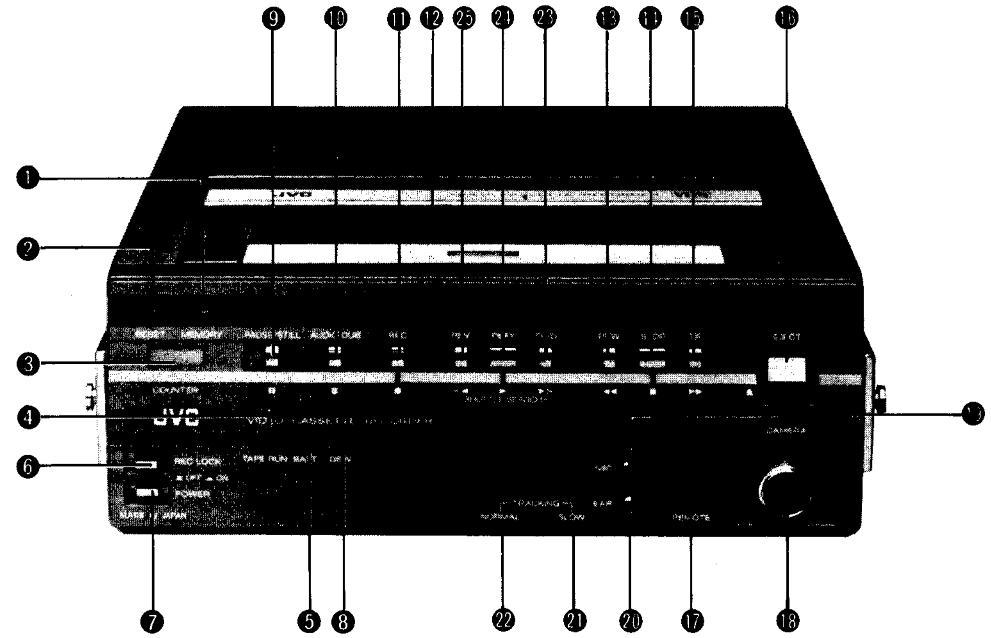
- Use the NB-P1 exclusive battery pack (optional) for battery operation.
- Recharge the battery pack immediately after every use.
- Use the AA-P22EG/EK AC Power Adapter or the TU-22EG/EK Tuner/Adapter for AC operation.
- Before switching the power off with either of these adapters, make sure that the HR-2200EG/EK recorder is in the Stop mode.

Maintenance

- Do not use thinner or benzine to clean the cabinet; use a piece of soft cloth. If it becomes excessively dirty, wipe with a cloth soaked in a neutral cleaner diluted with water and then with a dry cloth.

If malfunctioning occurs, stop using the unit immediately and consult your local JVC dealer.

CONTROLS AND CONNECTORS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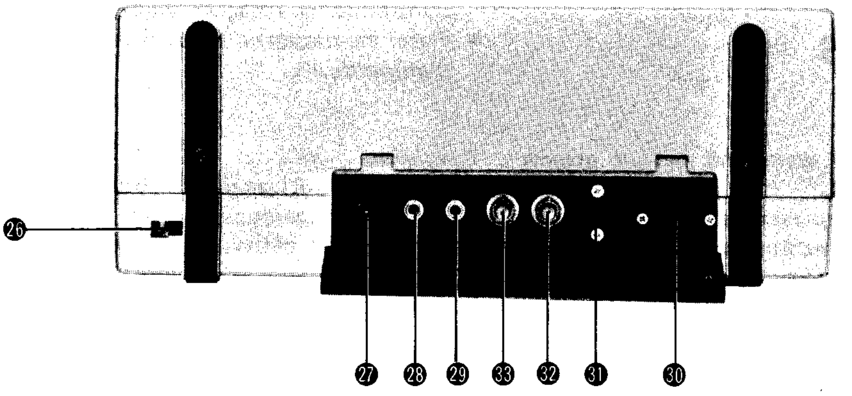
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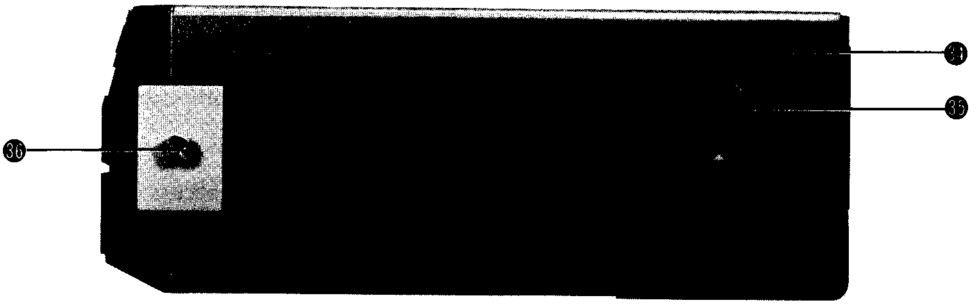
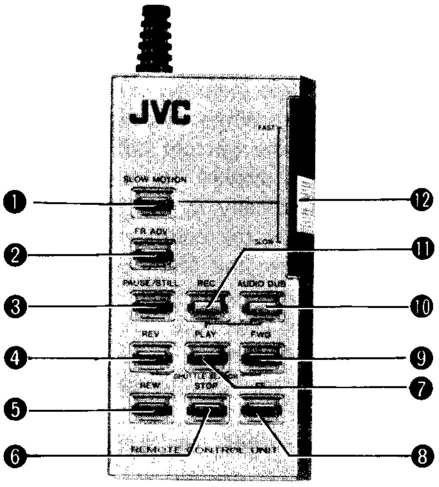


1. **MEMORY button**
   For automatic tape indexing in conjunction with the tape counter. When this button is pressed, "M" appears at the bottom left-hand corner of the tape counter display. In this state, the tape will stop automatically in the Rewind and Fast Forward modes at the counter reading of "0". At the same time, the Memory mode is automatically released with the indication "M" disappearing. (See page 25.)
2. **Counter RESET button**
   Press to reset the tape counter to "0".
3. **Tape COUNTER**
   Displays from "-1999" to "+1999" as the tape runs.
4. **Tape running indicator (TAPE RUN)**
   Flashes in synchronism with the take-up reel speed.
5. **Battery power warning indicator (BATT)**
   Lights red to warn of insufficient battery power.
6. **Recording standby mode lock button (REC LOCK)**
   This button is used together with the POWER button to save battery power while at the same time maintaining the Recording Standby mode so that smooth assembled recordings can be made. (See page 15.)
7. **POWER button**
   Press to turn the power ON (▬). Press again to turn the power OFF (■). Either in battery or AC operation, pressing this button in starts consuming power. Especially in battery operation, be sure to press this button to OFF whenever the recorder is not in use.
8. **Moisture condensation indicator (DEW)**
   As long as this indicator lights red, the recorder ceases to function in order to protect the video head and tape from damage. (See page 14.)
9. **PAUSE/STILL button**
   Press to stop the tape temporarily. During recording, press this button to avoid recording unwanted material. During playback, press this button to view a still picture.
10. **AUDIO DUB button**
    Press together with the PLAY button to record audio on a pre-recorded tape.
11. **Record button (REC)**
    Press together with the PLAY button for video and audio recording.
12. **Cassette housing**
    When the EJECT button is pressed, the cassette housing lifts gently.
    - When removing the cassette, make sure that the recorder is in the Stop mode. Then press the EJECT button.
13. **Rewind button (REW)**
    Press to rewind the tape. The REW button can be pressed directly from any mode except the Record and Audio Dub modes.
14. **STOP button**
    Press to stop the tape. When the STOP button is pressed, the tape is unloaded from around the tape transport mechanism and stops inside the cassette. This is referred to as the Stop mode. The LED indicator above the STOP button remains lighted in the Stop mode.
15. **Fast forward button (FF)**
    Press to fast forward the tape. The FF button can be pressed directly from any mode except the Record and Audio Dub modes.
16. **EJECT button**
    Press to lift the cassette housing.
17. **REMOTE control connector**
    Connect the provided remote control unit to this terminal.
18. **CAMERA connector**
    Connect a JVC video camera having a 10-pin camera cable to this connector.
19. **Microphone jack (MIC)**
    Connect a microphone for audio dubbing.
20. **Earphone jack (EAR)**
    Connect the provided earphone for monitoring the sound. The sound can be monitored during recording, playback, audio dubbing and in the E-E (Electric-Electric) mode in which the input signal is not being recorded onto the tape, but being monitored on a connected TV.
21. **TRACKING SLOW control**
    Turn this control to minimize noise bars, if observed during slow-motion or still-frame playback.
22. **TRACKING NORMAL control**
    Turn this control to minimize noise bars, if observed during normal-speed playback.
23. **SHUTTLE SEARCH FWD button**
    This button enables high-speed playback (video only) in the forward direction only while it is being pressed. (See page 20.)
24. **PLAY button**
    Press to play back the tape. Also press this button together with the REC button for recording or with the AUDIO DUB button for audio dubbing. The PLAY button should be pressed first for obtaining any playback mode.
25. **SHUTTLE SEARCH REV button**
    This button enables high-speed playback (video only) in the reverse direction only while it is being pressed. (See page 20.)

26. **RF converter channel adjustment screw**
For selecting between UHF channels 32 and 40 depending on the vacant channel for the RF output.
27. **RF OUT connector**
The output of the built-in RF converter is available from this connector. Connect to the UHF antenna terminal of a TV receiver for viewing video programmes on the TV screen.
28. **AUDIO OUT connector**
The audio signals being recorded or played back are available from this connector.
29. **AUDIO IN connector**
Connect a tape recorder or other audio sources for recording. This connector can also be used to connect to the audio output terminal of a tuner (other than the TU-22EG/EK Tuner/Adapter).
30. **TUNER/AC ADAPTER connector**
For the connection of the TU-22EG/EK Tuner/Adapter, AA-P22EG/EK AC Power Adapter or AP-P2E Car Battery Cord. When connected to the TU-22EG/EK, this connector handles audio and video signals, power supply and timer recording trigger signal. When connected to the AA-P22EG/EK or AP-P2E, it functions only as a power input connector.
31. **EXT LINE IN/TUNER select switch**
Set to TUNER when recording off-air TV programmes using the TU-22EG/EK Tuner/Adapter. Set to EXT LINE IN when recording sources connected to the VIDEO IN and AUDIO IN connectors.
For camera recording using a camera connected to the front panel CAMERA connector, this switch may be set to either position.
32. **VIDEO IN connector**
Connect a video signal source other than that from a JVC video camera. This connector can also be used to connect to the video output terminal of a tuner (other than the TU-22EG/EK Tuner/Adapter).
33. **VIDEO OUT connector**
The video signals being recorded or played back are available from this connector.
34. **Battery compartment**
Install the exclusive NB-P1 battery pack.
35. **BATTERY eject button**
Press this button to remove the battery.
36. **Shoulder strap/carrying handle retainer**
Attach either the shoulder strap or the carrying handle (provided).

REMOTE CONTROL UNIT



The provided full-function remote control unit allows operation of the HR-2200EG/EK from a distance. All tape control buttons are duplicated on the remote control unit, which has some additional tape control capabilities such as slow-motion playback at variable speeds and single-frame advance.

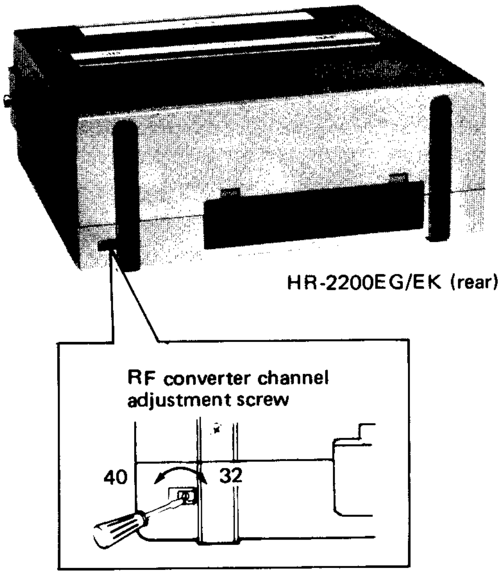
1. **SLOW MOTION button**
Press to view slow-motion playback.
2. **Frame advance button (FR ADV)**
Press to view the playback picture frame by frame. When this button is pressed once in the Still mode, the picture is advanced by one frame. Keeping this button pressed, the picture is advanced by one frame per second.
3. **PAUSE/STILL button**
Same as the PAUSE/STILL button on the recorder.
4. **SHUTTLE SEARCH REV button**
Same as the SHUTTLE SEARCH REV button on the recorder.
5. **REW button**
Same as the REW button on the recorder.
6. **STOP button**
Same as the STOP button on the recorder.
7. **PLAY button**
Same as the PLAY button on the recorder.
8. **FF button**
Same as the FF button on the recorder.
9. **SHUTTLE SEARCH FWD button**
Same as the SHUTTLE SEARCH FWD button on the recorder.
10. **AUDIO DUB button**
Same as the AUDIO DUB button on the recorder.
11. **REC button**
Same as the REC button on the recorder.
12. **SLOW MOTION speed control knob (FAST/SLOW)**
After engaging the Slow-motion mode, adjust the speed by sliding this knob to meet your specific needs; toward FAST for faster speeds and toward SLOW for slower speeds.

RF CONVERTER ADJUSTMENT

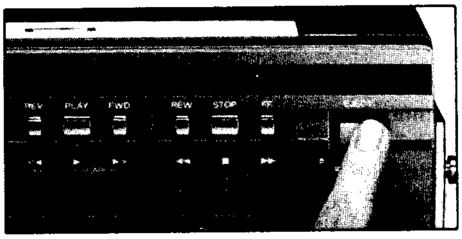
The HR-2200EG/EK incorporates an RF converter for playback using a TV receiver. The output of the RF converter can be seen on the TV screen on a vacant channel which is not used for public broadcasting. The RF converter in this unit has been set to UHF channel 36 before shipment. If channel 36 is employed for broadcasting in your area, reset the RF converter channel to one of the vacant channels between 32 and 40 as follows:

1. Adjust the TV receiver channel to one of the vacant channels.
2. Connect a video camera and switch the power on for the recorder.
3. While monitoring the camera signal on the TV screen, turn the RF converter channel adjustment screw in either direction so that the monitored picture comes in most clearly.

- Converter channel resetting is also possible using a prerecorded cassette. Play back the cassette and adjust the screw to obtain the clearest picture on the TV screen.
- When you wish to view video cassette programmes, always set the TV receiver's channel selector to your VIDEO CHANNEL.

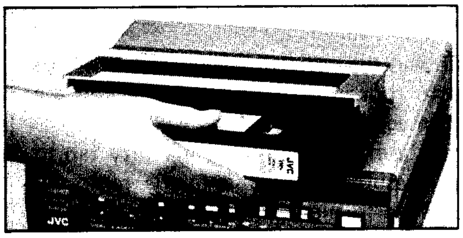


LOADING AND UNLOADING THE VIDEO CASSETTE

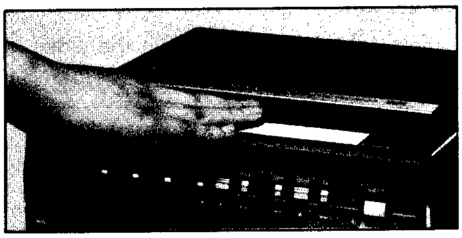


Loading

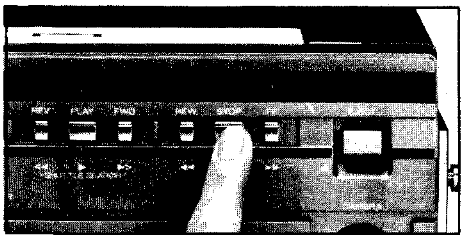
1. Press the EJECT button.
   The cassette housing will lift gently.



2. Insert a cassette fully and correctly.
   - An inverted cassette cannot be inserted.

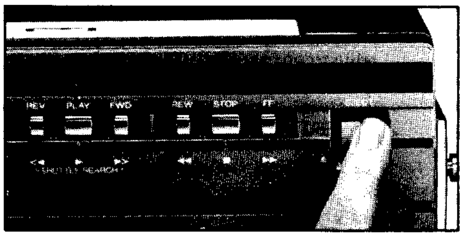


3. Press the cassette housing down to lock in place.
   - Be careful not to press the cassette housing with a cassette inserted midway.

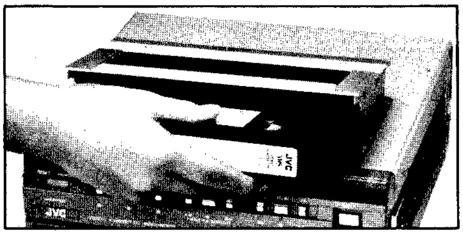


Unloading

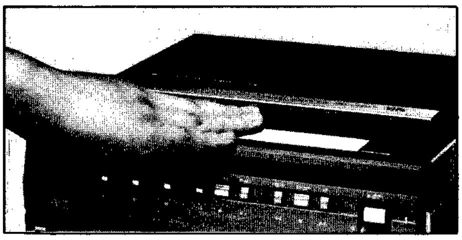
1. Make sure that the recorder is in the Stop mode.



2. Press the EJECT button.



3. Remove the cassette.



4. Press the cassette housing down until it locks.

If the EJECT button cannot be pressed in . . .
The tape is loaded around the tape transport mechanism and, therefore, the cassette housing is prevented from lifting up. Press the POWER button to ON and press the STOP button to return the tape into the cassette. Then the EJECT button becomes operative.

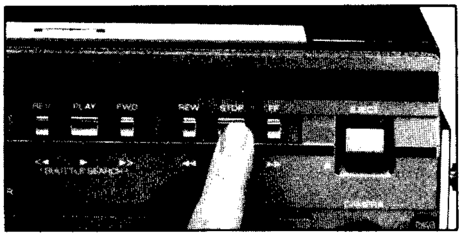
Notes

- Do not load and unload the cassette successively without allowing the tape to run at all. This would slacken the tape and thereby damage it.
- VHS video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has been removed, use cellophane tape to block the slot.

Refer to page 2 for more information regarding the video cassette.

BASIC OPERATIONS

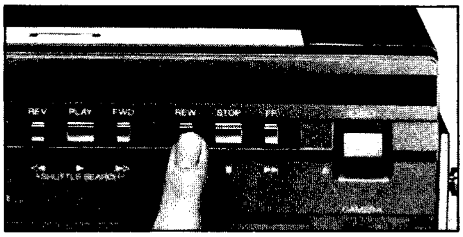
When operating this unit, first press the POWER button to ON (▬).


REV
PLAY
FWD
REW
STOP
FF
EJECT
SHUTTLE SEARCH
CAMERA

STOP button

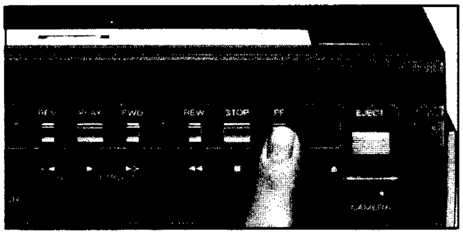
When the STOP button is pressed, the tape returns into the cassette and stops. (This is referred to as the Stop mode.)

- The STOP button has priority over all other operational modes.


REV
PLAY
FWD
REW
STOP
FF
SHUTTLE SEARCH
CAMERA

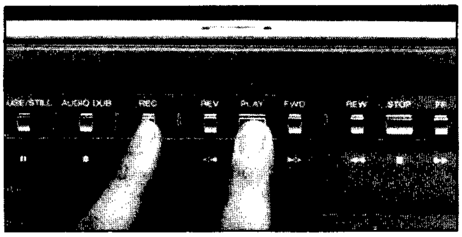
REW button

Press this button to rewind the tape.


REV
PLAY
FWD
REW
STOP
FF
EJECT
CAMERA

FF button

Press this button to fast forward the tape.


AUDIO DUB
REC
REV
PLAY
FWD
REW
STOP
FF

REC button

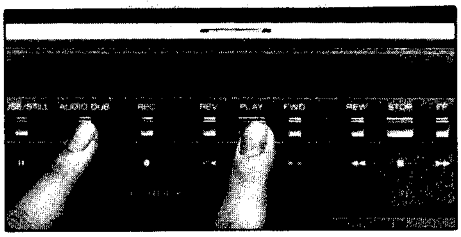
Press this button simultaneously with the PLAY button to start recording.

MEMORY
PAUSE/STILL
AUDIO DUB
REC
REV
PLAY
JVC

PAUSE/STILL button

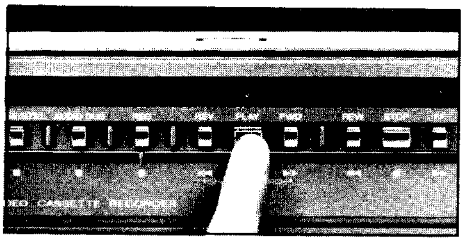
Press this button to stop the tape temporarily.

- When this button is pressed during recording, the input signal is seen on the TV screen, but recording does not take place.
- When this button is pressed during playback, a still picture can be obtained.
- To release the Pause or Still mode, press the PLAY button.


AUDIO DUB
REC
REV
PLAY
FWD
REW
STOP
FF

AUDIO DUB button

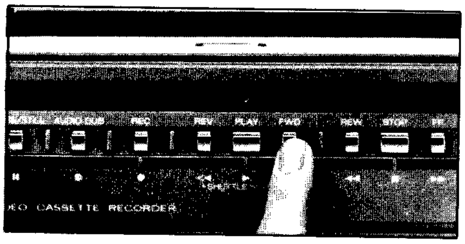
Press this button simultaneously with the PLAY button to record sound on pre-recorded tapes.



PLAY button

Press this button to play back pre-recorded cassettes.

- Press this button simultaneously with the REC button for recording or with the AUDIO DUB button for audio dubbing.



SHUTTLE SEARCH FWD button

When this button is pressed during playback, playback speed is accelerated to about 10 times normal.

SHUTTLE SEARCH REV button

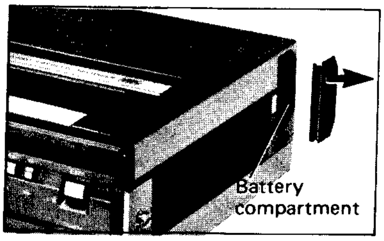
When this button is pressed during playback, reverse playback takes place at a speed about 10 times normal.

POWER SUPPLY

The HR-2200EG/EK employs a convenient three-way power supply system. Select household AC current, NB-P1 exclusive battery pack or car battery according to your specific situation.

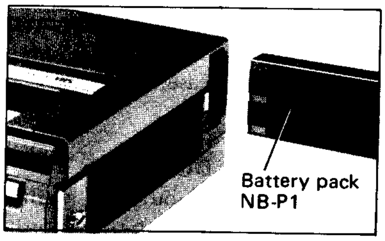
Using the exclusive NB-P1 battery pack (optional)

Use the exclusive NB-P1 battery pack when you operate the HR-2200EG/EK outdoors in combination with a video camera.

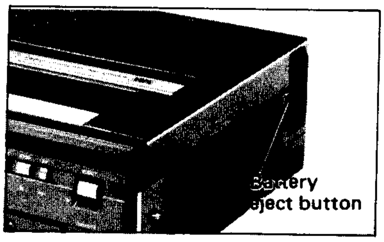


1. Remove the battery compartment cover.

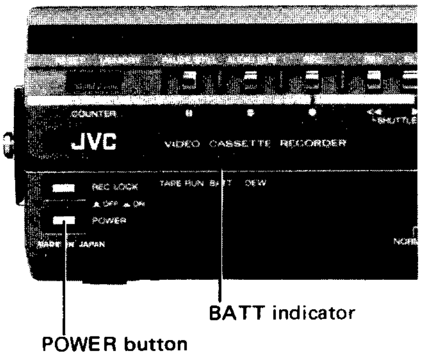
- After installing the battery pack, do not use the battery compartment cover.



2. Insert a battery pack into the compartment. When it is fully inserted, it locks automatically and electrical connection is made.



3. To unload the battery pack, push the BATTERY eject button.

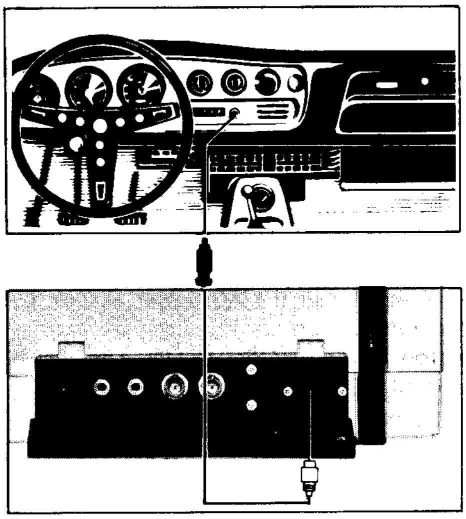


Notes

- Prior to inserting a battery pack, be sure to set the POWER button to OFF (▲).
- Before use, be sure to recharge the battery pack. For recharging procedures, refer to page 12.
- Exercise special care not to allow any foreign matter to enter the battery compartment, otherwise malfunctioning may occur.
- If the BATT indicator on the front panel should light during operation via the battery pack, the battery power is nearing its end. Recharge the battery pack or replace it with a fully charged one.

Using a car battery

When you wish to drive the HR-2200EG/EK with a car battery, employ the AP-P2E Car Battery Cord (optional).



1. Plug one end of the car battery cord into the car's cigarette lighter socket.
   - Prior to connecting, be sure to set the POWER button to OFF (▲).
2. Plug the other end of the cord into the recorder's TUNER/AC ADAPTER connector.

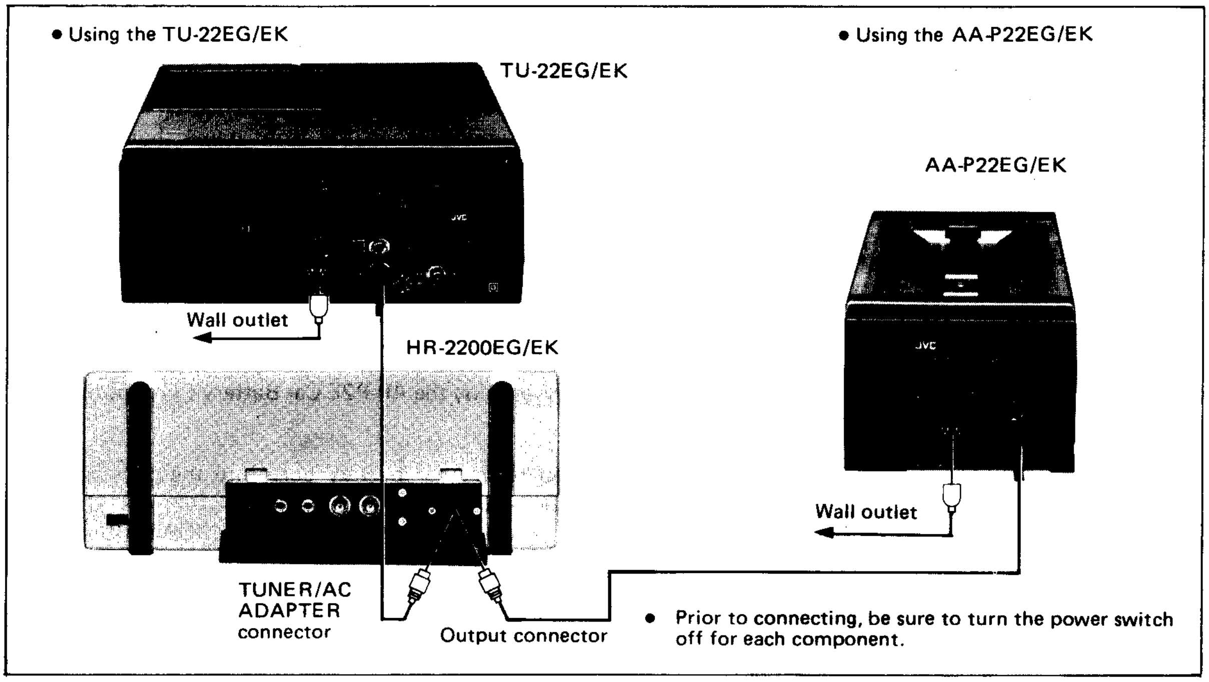
Notes

- To stop power supply, be sure to put the recorder in the Stop mode first. Then unplug the cord.
- Use the car battery with the engine idling or while driving the car in order to avoid discharging the car battery.
- The AP-P2E car battery cord is exclusively for 12-volt NEGATIVE-GROUNDED car batteries. It cannot be connected to cars having positive-grounded batteries.
- When the car battery cord is connected to the recorder, power supply from the built-in battery pack is automatically switched off.

Using household AC

If you wish to power the HR-2200EG/EK from an AC outlet, employ either the TU-22EG/EK Tuner/Adapter or the AA-P22EG/EK AC Power Adapter.

Connection

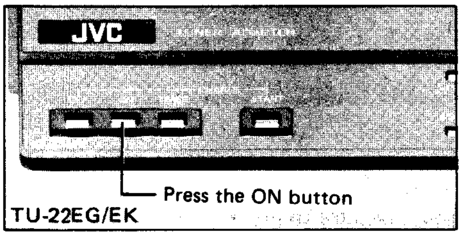


- Using the TU-22EG/EK
- Using the AA-P22EG/EK

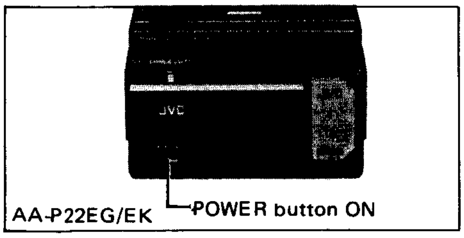
TU-22EG/EK
Wall outlet
HR-2200EG/EK
TUNER/AC ADAPTER connector
Output connector
AA-P22EG/EK
Wall outlet

- Prior to connecting, be sure to turn the power switch off for each component.

Operation



JVC
Press the ON button
TU-22EG/EK



AA-P22EG/EK
POWER button ON

- After making correct connections as illustrated, turn the power on for the tuner/adapter or the AC power adapter by pressing the relevant button.
- Press the POWER button of the recorder to ON. This makes the recorder to be powered from the AC outlet.
- Prior to switching the power off, be sure that the recorder is in the Stop mode.

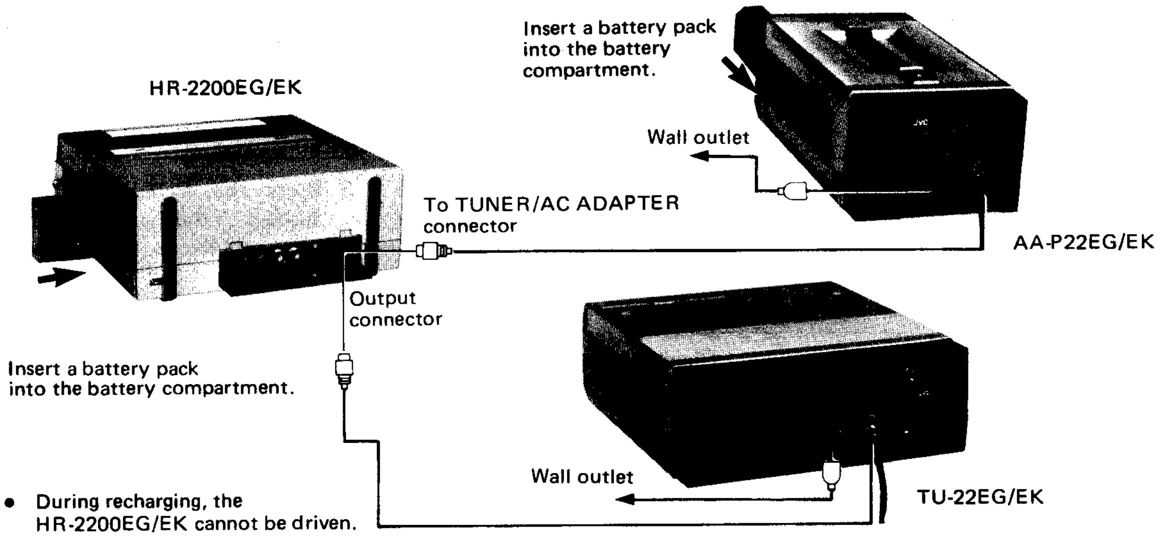
Notes

- When the tuner/adapter or the AC power adapter is connected to the recorder, power supply from the built-in battery pack is automatically switched off.
- If a power failure should occur during AC operation, the video cassette cannot be removed unless the recorder is already in the Stop, Rewind or Fast Forward mode. In such cases, wait until power is re-applied.

RECHARGING THE NB-P1 BATTERY PACK

Either the AA-P22EG/EK AC Power Adapter or the TU-22EG/EK Tuner/Adapter can be used to recharge the NB-P1 battery pack.

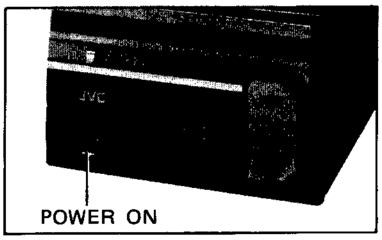
- For more information, refer to the instruction manual relevant to those models.
- Prior to connecting, switch the power off for the AA-P22EG/EK or TU-22EG/EK.

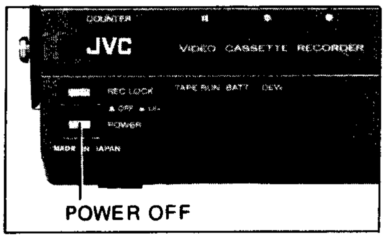

Insert a battery pack
into the battery
compartment.
HR-2200EG/EK
Wall outlet
To TUNER/AC ADAPTER
connector
AA-P22EG/EK
Output
connector
Insert a battery pack
into the battery compartment.
Wall outlet
TU-22EG/EK

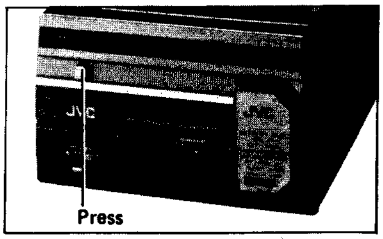
- During recharging, the HR-2200EG/EK cannot be driven.

Using the AA-P22EG/EK AC Power Adapter

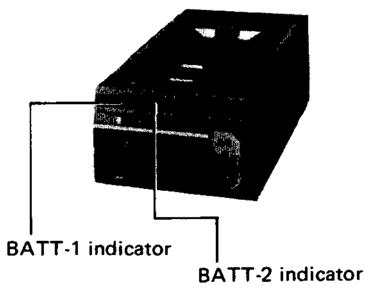
The AA-P22EG/EK can recharge two battery packs in series. First the battery pack installed in the HR-2200EG/EK is recharged and then, automatically, the battery pack installed in the adapter is recharged.




JVC
POWER OFF



1. Insert a battery pack into the recorder or the adapter, or into both.
   Press the POWER button on the adapter to ON.
2. After making sure that the recorder is in the Stop mode, press the POWER button on the recorder to OFF.
3. Press the CHARGE START button on the adapter.

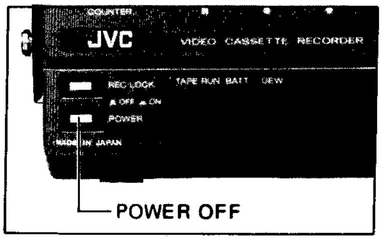

BATT-1 indicator
BATT-2 indicator

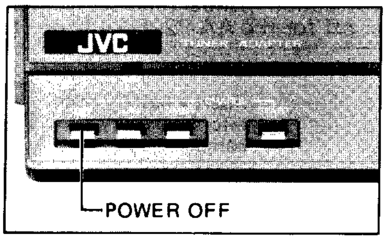
Checking the charging condition

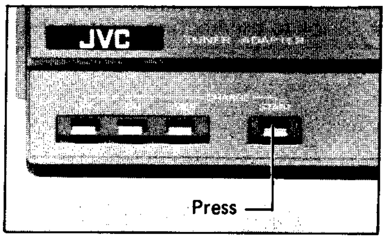
- During charging, either one of the BATT indicators remains lighted. The indicator turns off when the battery pack is fully charged.
- The BATT-1 indicator takes care of the battery installed in the recorder, and the BATT-2 indicator the battery installed in the adapter.
- If two batteries are to be recharged in series, recharging time is about 3 hours.
- Recharging will be finished in about 90 minutes when one battery, installed either in the recorder or adapter, is being recharged.
- Recharging automatically stops if you press the POWER button of the recorder to ON during recharging. If you continue recharging, press the POWER button of the recorder to OFF and press the CHARGE START button of the adapter once again.

Using the TU-22EG/EK Tuner/Adapter

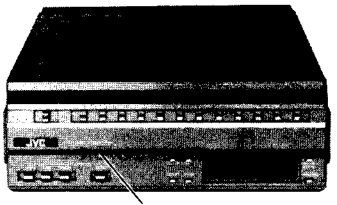
The TU-22EG/EK can recharge the battery pack installed in the recorder.







1. After confirming that the recorder is in the Stop mode, press the POWER button of the recorder to OFF.
2. Insert a battery pack into the battery compartment of the recorder and press the POWER OFF button of the Tuner/Adapter.
3. Press the CHARGE START button of the Tuner/Adapter.

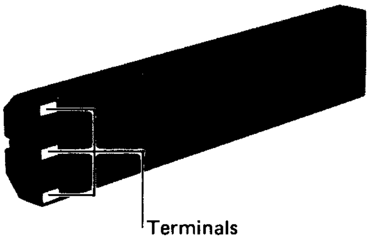


Checking the charging condition

- During charging, the LED indicator above the CHARGE START button of the Tuner/Adapter remains lighted. The indicator turns off when the battery pack is fully charged.
- Charging time is about 90 minutes.
- Immediately after the battery pack has been fully recharged, it may have become warm. This is not due to any defect of the battery pack.

A WORD ON THE NB-P1 EXCLUSIVE BATTERY PACK

The NB-P1 is a nickel-cadmium battery. Give attention to the following to make the most of its characteristics.



- Before each use, fully recharge the battery pack.
- Even when you are not using the battery pack, it will gradually discharge of itself. This natural discharging is accelerated as the ambient temperature rises. Therefore, it is recommended that you store the battery pack at a place of low temperatures.
- Do not discard the battery pack into a fire or do not leave it continuously exposed to high temperatures.
- The battery pack has its own service life. If its operating time becomes exceeding short even though you recharge it correctly, it means that the battery pack is nearing the end of its service life. Replace with a fresh one in such cases.

Temperature ranges

The recharging time is based on room temperature of 20°C with a power supply of 220 V (EG-version) or 240 V (EK-version). The lower the temperature, the longer the recharging time.

For charging: 10°C to 35°C
For operating: -10°C to 40°C
For storing: -10°C to 30°C

Caution

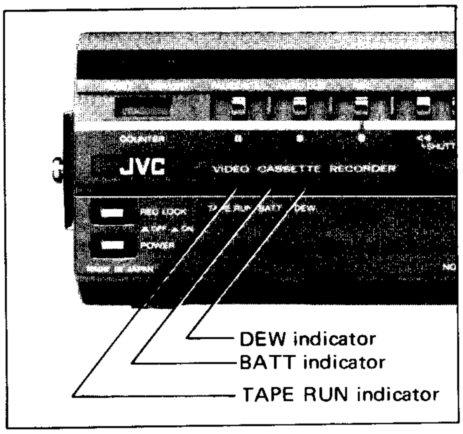
The terminals are exposed on the bottom of the battery pack. DO NOT short-circuit these terminals.

- If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe them with a piece of soft cloth.

TAPE RUNNING, MOISTURE CONDENSATION AND BATTERY POWER INDICATORS

To assure worry-free operation, the HR-2200EG/EK is equipped with LED indicators; one for tape running, one for battery power and one for moisture condensation. These indicators function when the POWER button is pressed to ON.

INDICATORS

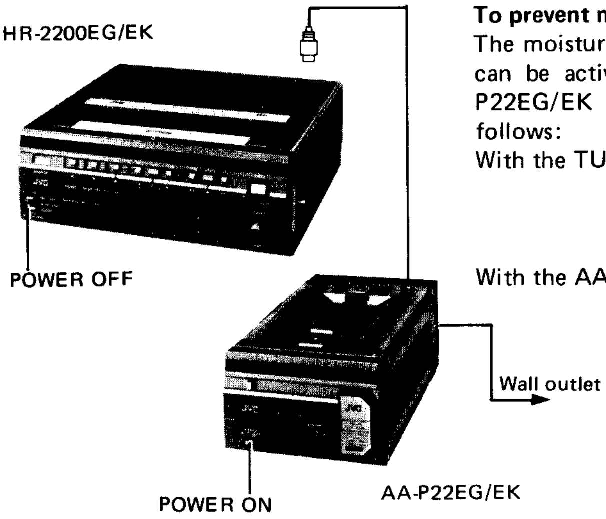


TAPE RUN indicator
This indicator flickers red while the tape is running. The flickering speed is synchronized with the take-up reel speed. It turns off in the Stop, Pause and Still modes.
During recording or normal playback: The indicator flickers showing that the tape is running normally.
During rewinding, fast forwarding or shuttle search operation: The flickering speed is accelerated.

BATT indicator
During battery operation this indicator warns of insufficient power. If it lights red, recharge the battery pack or replace it with a fully charged one. For recharging, refer to page 12.

DEW indicator

- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.
- Moisture in the air will condense on the head drum when you move the unit from a cold place to a warm place, after heating a cold room or under extremely humid conditions.
- The DEW indicator informs you that moisture has condensed inside the unit. As long as the DEW indicator remains lighted red, the HR-2200EG/EK cannot be operated.
- If the DEW indicator lights red when you have powered the recorder, you must wait for a few hours until the indicator turns off.

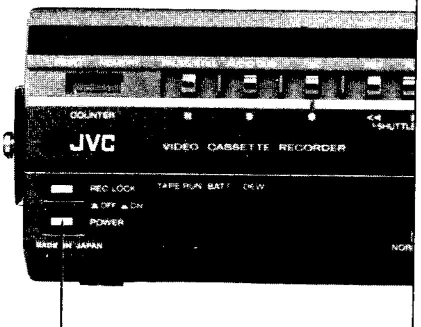


To prevent moisture condensation
The moisture condensation prevention heater inside the recorder can be activated if you leave either the TU-22EG/EK or AA-P22EG/EK connected to the recorder and set these units as follows:

With the TU-22EG/EK:	The OFF button of the TU-22EG/EK should be engaged and the POWER button of the HR-2200EG/EK should be OFF.
With the AA-P22EG/EK:	The POWER button of the AA-P22EG/EK should be ON and the POWER button of the HR-2200EG/EK should be OFF.

When not using the recorder for a long period of time, unplug the TU-22EG/EK or AA-P22EG/EK from the AC outlet to save energy.

POWER BUTTON AND RECORDING LOCK BUTTON

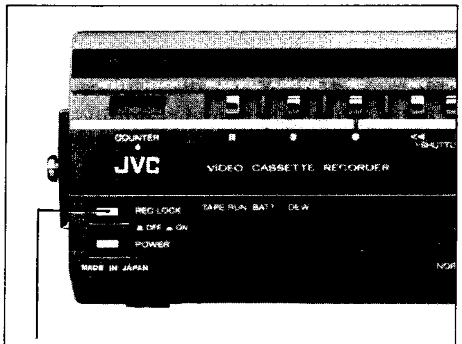


POWER button

POWER button

When this button is pressed to ON (▬), the recorder is powered and starts consuming power either from the built-in battery pack, car battery or AC via the AA-P22EG/EK or TU-22EG/EK.

- When this button is pressed to ON, the STOP indicator lights informing you that the recorder is in the Stop mode.
- If you switch the power off in the Record or Play mode, the tape stops as it is loaded around the tape transport mechanism. And, when the power is re-applied, it automatically enters the Stop mode, unless the REC LOCK button is pressed in.
- When not in use, switch the power off to save power.



REC LOCK button

REC LOCK button

This button is especially helpful to save battery power when the recorder is used in combination with a camera.

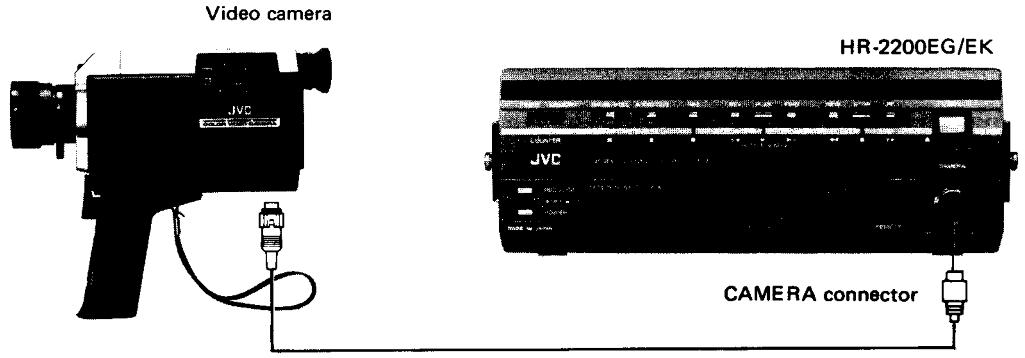
- Since the ESC (Edit Start Control) system functions only when recording is initiated from the Pause mode (with the tape loaded around the tape transport mechanism), it is necessary to keep the Pause mode for obtaining clean assembled recordings. This also means that you have to keep powering the recorder.
- The REC LOCK button is incorporated to avoid such unnecessary power consumption while operating in the Recording Standby mode.
- You can switch off the power while in the Record mode. When you re-apply power, first press the REC LOCK button and then the POWER button. Then the tape will not enter the Stop mode, but directly start recording from the Pause mode allowing the ESC system to function as it should (See page 17).
- If you leave the REC LOCK button engaged, you have only to press the POWER button to ON or OFF to control the starting and stopping of recording.

CAUTION

- If the POWER button is pressed to ON with the REC LOCK button engaged, recording automatically starts. If a prerecorded cassette is loaded, it will be erased and re-recorded. Make it a rule to release the REC LOCK button by pressing it again after using the Recording Standby mode lock facility.

RECORDING WITH A VIDEO CAMERA

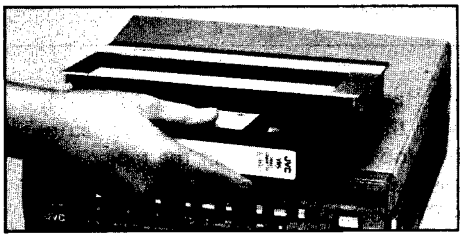
Connection



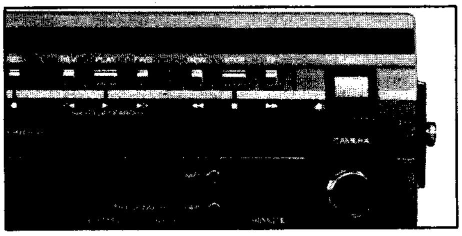
- Read carefully the instruction manual for the camera to be connected.

- For powering the system, refer to pages 9, 10 and 11.

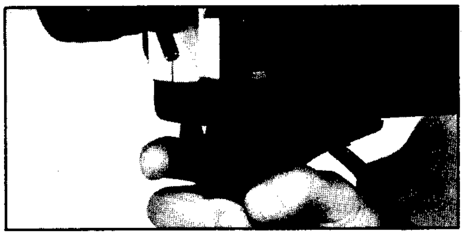
Operation



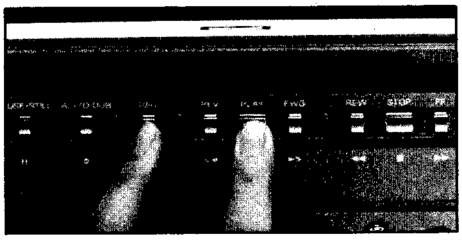
1. Load a video cassette correctly.



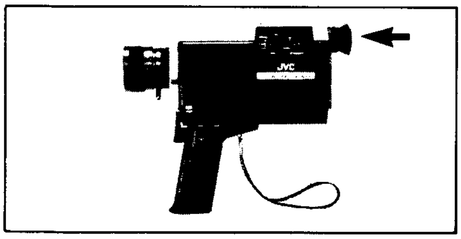
2. Press the POWER button of the recorder to ON.
   - The LED indicator above the STOP button will light.
   - The recorder will start consuming power.
   - This also will start supplying power to the camera, and if a monitor or TV receiver is connected to the recorder or if the electronic viewfinder is used, pictures can be monitored on the TV or viewfinder screen.



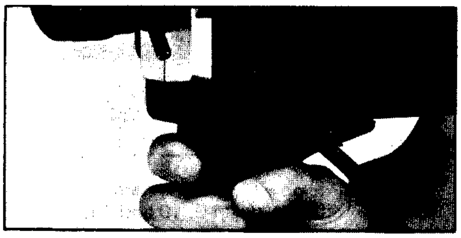
3. Make sure that the camera's trigger switch is in its "off" position.



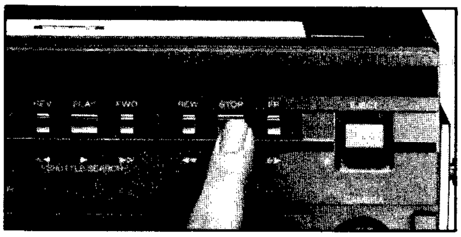
4. Press the REC and PLAY buttons simultaneously.
   - Recording does not take place as long as the camera's trigger switch is in its "off" position. This state is referred to as the "Recording Standby" mode.



5. Adjust the exposure, focus and composition, looking through the viewfinder.



6. Press the camera's trigger switch.
   - Recording will start, with both the REC and PLAY indicators lighting.
   - To stop recording temporarily, release the trigger switch to enter the Recording Standby mode.

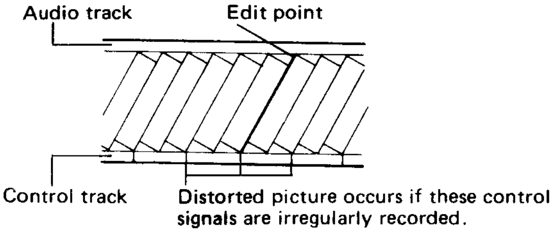


7. To end recording, press the STOP button of the recorder and then the POWER button to OFF.

Notes

- If you remain in the Recording Standby mode for longer than 5 minutes with the power on, the recorder automatically enters the Stop mode to protect the tape.
- If the battery power becomes insufficient during battery operation, the BATT indicator lights red and then the recorder automatically enters the Stop mode.

To produce clean assembled recordings


Audio track
Edit point
Control track
Distorted picture occurs if these control signals are irregularly recorded.

- The HR-2200EG/EK incorporates the ESC (Edit Start Control) mechanism which minimizes picture distortion between separately recorded segments. As long as the starting and stopping of the tape is controlled by the camera's trigger switch, this ESC mechanism functions to start recording of the next segment exactly at the edit point.
- If you wish to stop recording longer than 5 minutes for preparing for the next shot, turn the power off to save battery power.
  However, even in such a case, clean assembled recordings can be made by using the REC LOCK button.

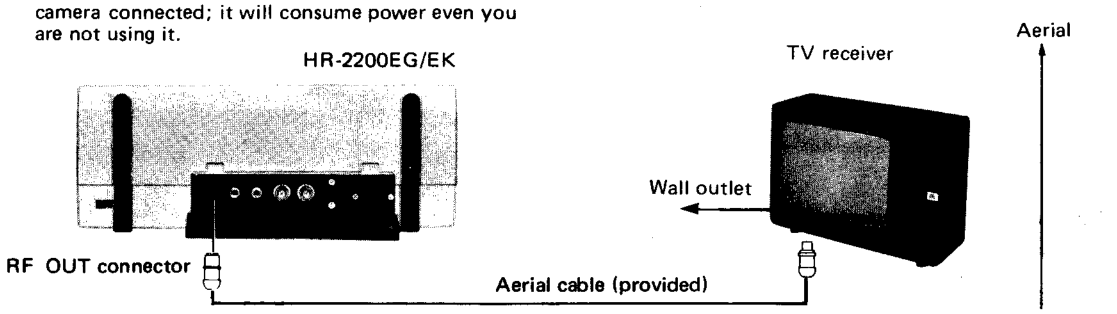
1. After step 6 above, release the trigger switch to "off".
2. Press the POWER button to OFF.
   - The Recording Standby mode is maintained even though power is switched off.
   - Take time to prepare for the next shot. Since the video head drum has stopped rotating, there is no need to worry about tape damage however long you remain in the Recording Standby mode.
3. When you are ready for the next shot, first press the REC LOCK button and then the POWER button.
   - Power is applied while the Recording Standby mode is engaged.
4. After about 10 seconds (this warm-up time is necessary for both the camera and the recorder), press the camera's trigger switch to start recording.
   - This enables the ESC mechanism to function in the same manner as if the tape was stopped by the trigger switch, producing smoothly assembled shots.
   - The REC LOCK button may be left engaged as long as you wish to continue assembled recordings. However, be sure to release it to OFF after putting the recorder in the Stop mode.

PLAYBACK USING A TV RECEIVER

Connection

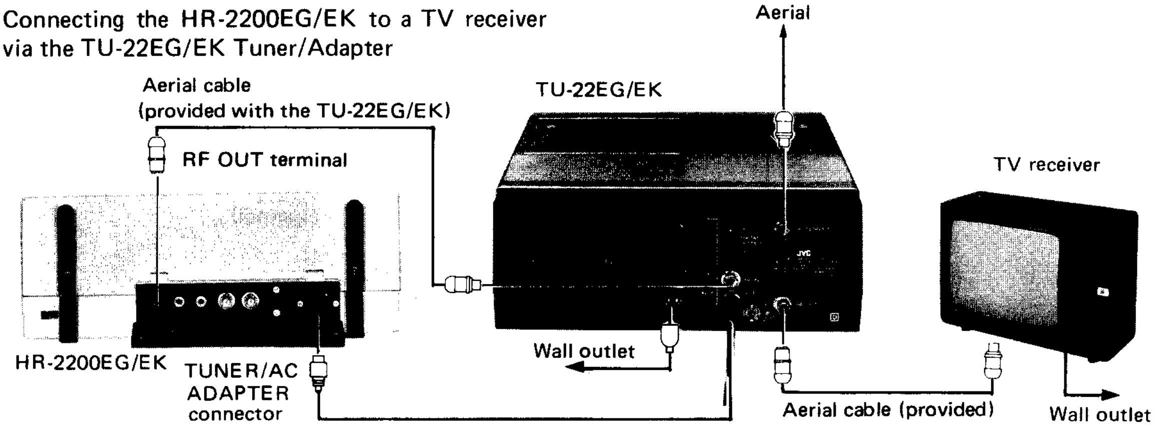
Connecting the HR-2200EG/EK directly to a TV receiver

Note: Employ a fully recharged battery pack. For continuous playback, one fully-charged battery pack lasts for about 2 hours. Do not leave a video camera connected; it will consume power even you are not using it.


Aerial
HR-2200EG/EK
TV receiver
Wall outlet
RF OUT connector
Aerial cable (provided)

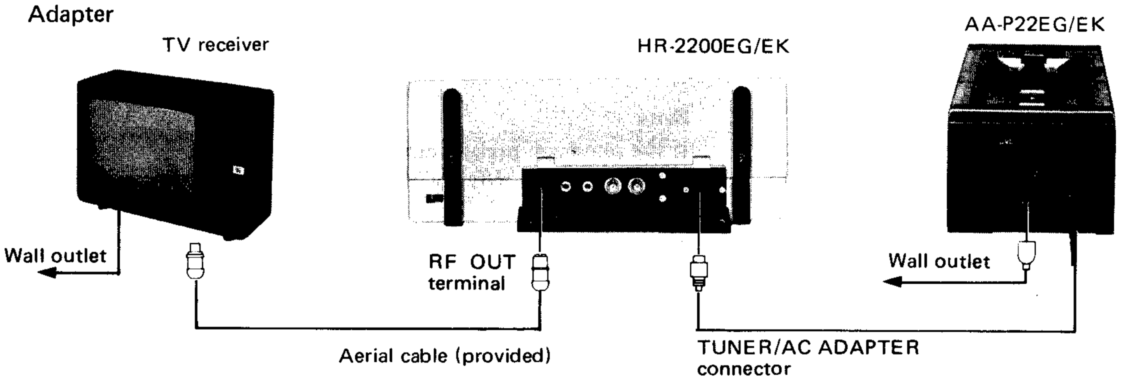
Remove the aerial from the TV receiver and connect the aerial cable (provided) to the TV receiver's aerial terminal.

Connecting the HR-2200EG/EK to a TV receiver via the TU-22EG/EK Tuner/Adapter

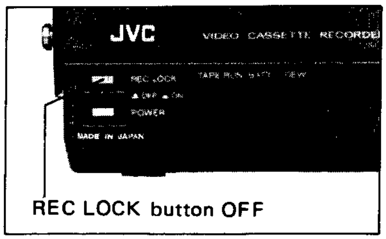

Aerial
Aerial cable
(provided with the TU-22EG/EK)
TU-22EG/EK
RF OUT terminal
TV receiver
Wall outlet
HR-2200EG/EK
TUNER/AC ADAPTER connector
Aerial cable (provided)
Wall outlet

* For more details, refer to the instruction manual for the TU-22EG/EK

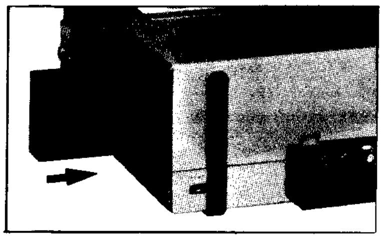
Connecting the HR-2200EG/EK to a TV receiver for playback using the AA-P22EG/EK AC Power Adapter


AA-P22EG/EK
TV receiver
HR-2200EG/EK
Wall outlet
RF OUT terminal
Wall outlet
Aerial cable (provided)
TUNER/AC ADAPTER connector

Operation

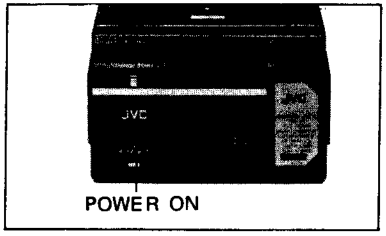


1. Load a pre-recorded cassette correctly and make sure that the REC LOCK button is released.
   - If the REC LOCK button is engaged, press it to release.



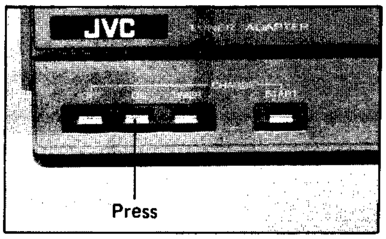
When using the NB-P1 battery pack

2. Install the fully-charged battery pack into the HR-2200EG/EK.



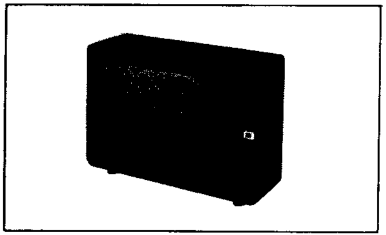
When using the AA-P22EG/EK AC Power Adapter

2. Set the POWER button of the AA-P22EG/EK to ON.



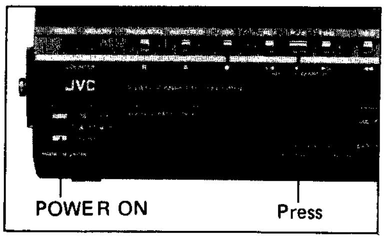
When using the TU-22EG/EK Tuner/Adapter

2. Press the sub-power ON button of the TU-22EG/EK.

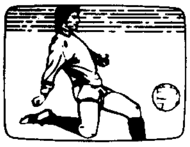


3. Set the TV receiver's channel selector to the RF converter output channel (your video channel).

Note
If hum noise is heard or noise bars appear on the TV receiver when you are using the recorder placed on the TV receiver, keep the recorder away from the TV receiver.



4. Press the POWER button of the HR-2200EG/EK to ON and then press the PLAY button.

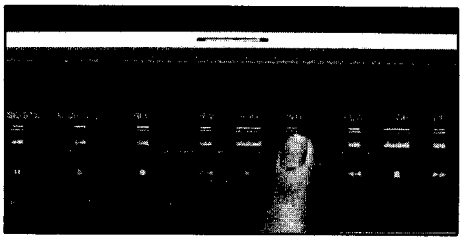


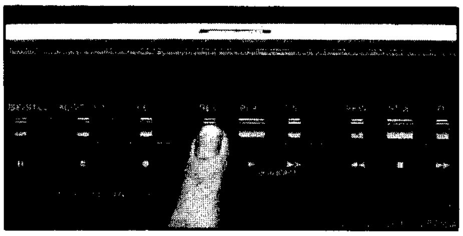
Note

If the playback picture contains noise bars.
Is the TRACKING NORMAL control of the recorder properly adjusted? Turn the knob to centre until a click is heard. If noise bars still appear, turn the knob slowly in either direction until they move out of the screen. Recording should always be done with this control returned to centre.

SHUTTLE SEARCH AND VARIABLE-SPEED PLAYBACK

The HR-2200EG/EK permits variable-speed playback. Among several different modes, the Shuttle Search and Still playback can be performed with both the recorder's controls and the remote control unit, while slow-motion playback and frame advancing are possible only via the remote control unit.





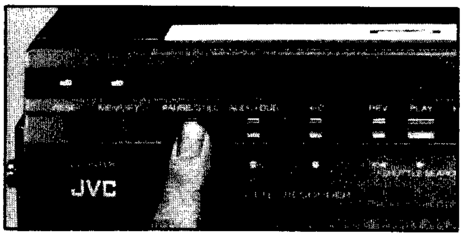
Shuttle search function

Forward or reverse playback at a speed about 10 times the normal is called "shuttle search" and is useful to find a particular tape segment quickly while also referring to the picture on the screen.

- Engage the Play mode by pressing the PLAY button.
- To shuttle-search in the forward direction, press the SHUTTLE FWD button. The tape will be played back at a speed about 10 times the normal while the button is being pressed.
- To shuttle-search in the reverse direction, press the SHUTTLE SEARCH REV button. The tape will be played back in the reverse direction at a speed about 10 times the normal while the button is being pressed.
- When the button is released, normal playback is resumed.

Notes

- Several noise bars will appear during shuttle-search operation. This is not due to any defect of the unit.
- If the picture rolls vertically, make adjustment using the TV receiver's V-hold control.

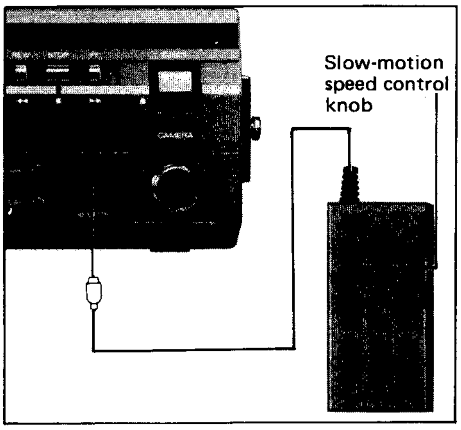


Still-frame playback

- Engage the Play mode by pressing the PLAY button.
- To view a still picture, press the PAUSE/STILL button.
- To stop still-frame playback, press the PLAY button.

Note

- If you remain in the Still mode continuously for longer than 5 minutes, the recorder automatically enters the Stop mode.

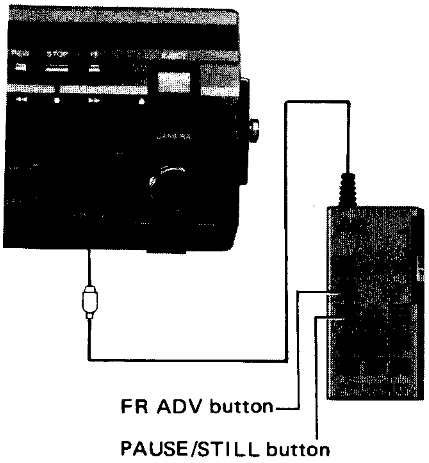


Slow-motion playback using the remote control unit

- Connect the provided remote control unit to the REMOTE connector of the recorder.
- Engage the Play mode by pressing the PLAY button.
- To start slow-motion playback, press the SLOW button.
- To vary the slow-motion speed, slide the speed control until you get the desired speed; toward FAST for faster speeds and SLOW for slower speeds.
- To restore the normal playback, press the PLAY button.

Note

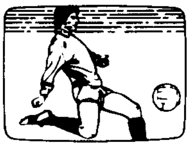
If you remain in the Slow mode continuously for longer than 5 minutes, the recorder automatically enters the Stop mode.


FR ADV button
PAUSE/STILL button

Frame-advance playback using the remote control unit

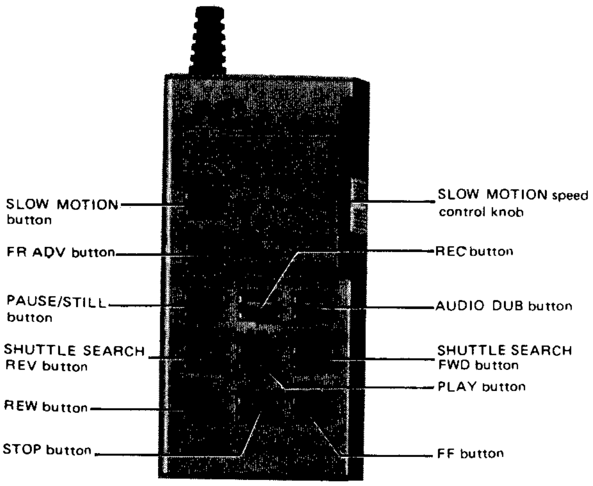
- Connect the provided remote control unit.
- Engage the Play mode by pressing the PLAY button.
- Press the PAUSE/STILL button.
- Then press the FR ADV button. Pressing it once advances the picture by one frame. Keeping it pressed advances the picture by one frame per second.
- To restore the normal playback, press the PLAY button.

Note
If you remain in the Frame-advance mode continuously for longer than 5 minutes, the recorder automatically enters the Stop mode.



Note
Noise bars may appear during still-frame, slow-motion and frame-advance playback. In such a case, first check to see if the SLOW TRACKING control has gotten out of place. First turn the SLOW TRACKING control to the centre until a click sound is heard. If noise still remains, engage the Slow-motion mode and turn the SLOW TRACKING control slowly in either direction until the noise bars move out of the frame.

- If noise bars cannot be removed by adjusting the TRACKING control, consult your local JVC dealer.


SLOW MOTION button
FR ADV button
PAUSE/STILL button
SHUTTLE SEARCH REV button
REW button
STOP button
SLOW MOTION speed control knob
REC button
AUDIO DUB button
SHUTTLE SEARCH FWD button
PLAY button
FF button

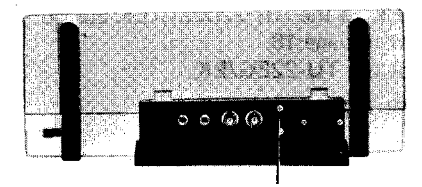
Remote control unit

- The provided remote control unit is exclusively for use with the HR-2200EG/EK.
- Connection should be made to the REMOTE connector on the front panel.
- All controls except SLOW, FR ADV and speed control functions are the same as the corresponding buttons on the recorder.

The recorders controls are operative even when the remote control unit is connected.

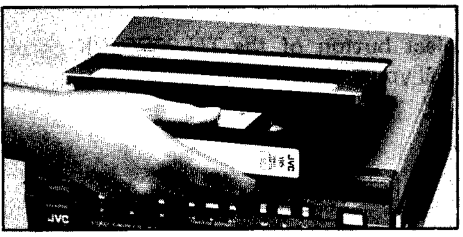
RECORDING OFF-AIR TV PROGRAMMES USING THE TU-22EG/EK TUNER/ADAPTER

The HR-2200EG/EK permits recording off-air TV programmes when combined with the TU-22EG/EK Tuner/Adapter (optional).

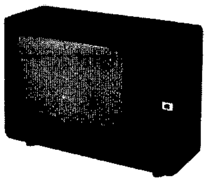

EXT LINE IN/TUNER select switch

- Connect the TU-22EG/EK and TV receiver correctly to the HR-2200EG/EK.
  - For connection, refer to page 18.
- Switch the power on for these units.

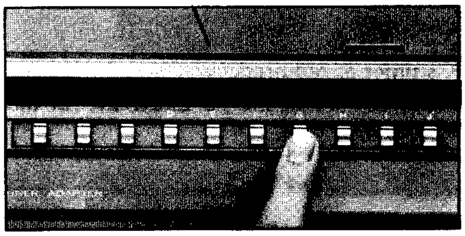
1. Set the EXT LINE IN/TUNER select switch, located on the rear panel of the HR-2200EG/EK, to TUNER.



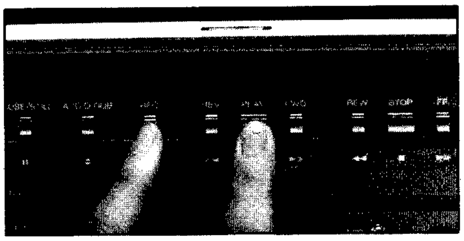
2. Load a video cassette correctly.
   - Make sure that the cassette safety tab is in place.



3. Set the TV receiver's channel selector to the RF converter output channel (your video channel).



4. Press the channel select button of the TU-22EG/EK corresponding to the channel you wish to record.



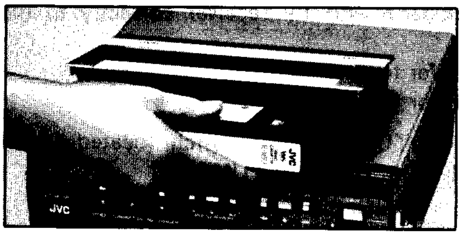
5. Press the REC and PLAY buttons simultaneously.
   - This will start recording of the programme appearing on the TV screen.
   - To stop recording, press the STOP button.

Caution
If a video camera is connected to the front panel CAMERA connector during recording of off-air TV programmes, the camera signals have priority and will be recorded. Disconnect a video camera when you wish to record off-air TV programmes.

Recording one TV programme while watching another
Set the TU-22EG/EK for recording one TV programme in the same manner as described in steps 1 – 5, and set the TV receiver channel to any other channel you wish to view.

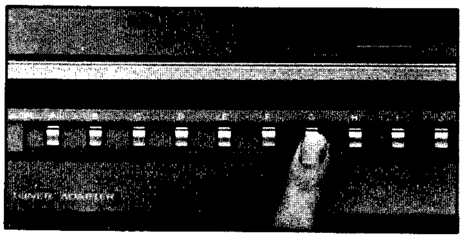
TIMER RECORDING USING THE TU- 22EG/EK TUNER/ADAPTER

The TU-22EG/EK's built-in timer enables automatic unattended recording on any day of the coming 10 days including the day of setting.

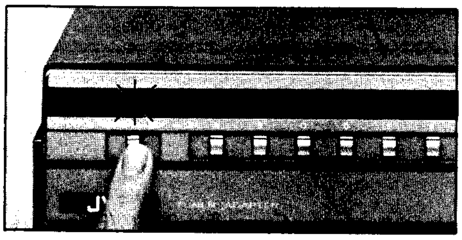


- Connect the TU-22EG/EK to the HR-2200EG/EK correctly
  - For connection, refer to page 18.
- Switch the power on for the TU-22EG/EK.

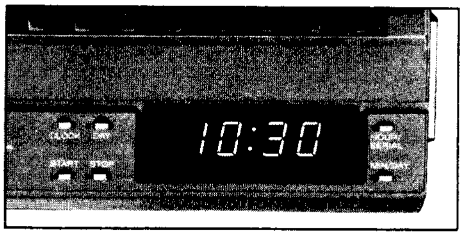
1. Load a video cassette correctly.



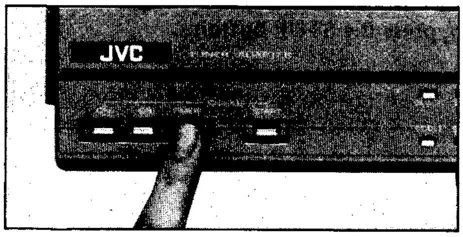
2. Press the channel select button of the TU-22EG/EK corresponding to the channel you wish to record.



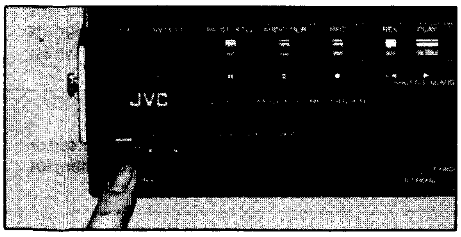
3. Press the CHANNEL LOCK button of the TU-22EG/EK to ON.
   - The CHANNEL LOCK indicator will light.



4. Set the TU-22EG/EK's timer as required.
   - Refer to the instruction manual of the TU-22EG/EK for the procedure of timer setting.



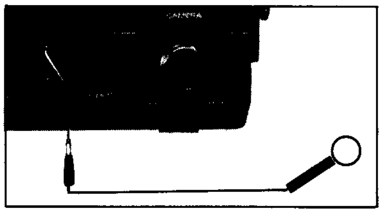
5. Press the TIMER button of the TU-22EG/EK.
   - The power indicator of the TU-22EG/EK will turn off.

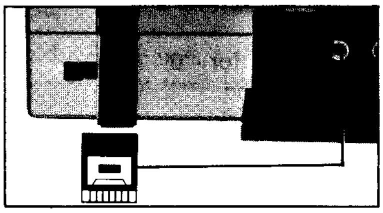


6. Press the POWER button of the HR-2200EG/EK to ON.
   - When the desired preset time is reached, power will be applied to the recorder and, due to the timer start signal supplied from the TU-22EG/EK, the recorder will start recording automatically.
   - There is no need to press the REC and PLAY buttons to engage the Recording Standby mode.

AUDIO DUBBING

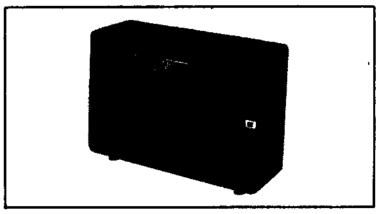
Audio dubbing means recording a sound track on a prerecorded cassette. Sound from a source connected to the rear panel AUDIO IN connector of the HR-2200EG/EK or from a microphone connected to the front panel MIC jack can be recorded.



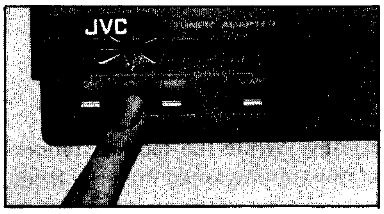


- Connect the HR-2200EG/EK to the TU-22EG/EK or AA-P22EG/EK and the TV receiver correctly.
- Connect a microphone to the front panel MIC jack when recording a narration or a song through the microphone.
- Connect a tape recorder or other audio sources to the rear panel AUDIO IN connector when recording background music or other previously recorded audio. In this case, the rear panel EXT LINE IN/TUNER select switch should be set to EXT LINE IN.

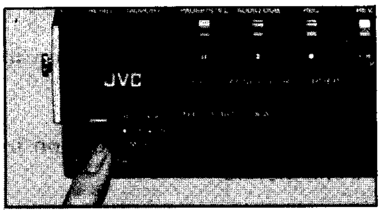
1. Load a pre-recorded cassette.



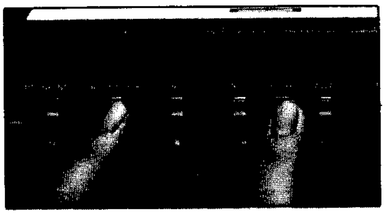
2. Set the TV receiver channel to the channel of the RF converter to monitor the playback picture while dubbing audio.



3. Switch the power on for the AA-P22EG/EK or TU-22EG/EK.



4. Press the POWER button of the HR-2200EG/EK to ON.



5. Press the AUDIO DUB and PLAY buttons simultaneously.
   - The AUDIO DUB and PLAY indicators will light and audio dubbing will start.

- The pause function facilitates audio dubbing. First play back the pre-recorded tape and press the PAUSE/STILL button at the point from which you wish to start audio dubbing. Then press the AUDIO DUB and PLAY buttons simultaneously. This permits you to start audio dubbing exactly at the right point.

Notes

- The previously recorded sound is erased and replaced with a new sound track by audio dubbing.
- If the MIC jack and the AUDIO IN connector are used at the same time, the input from the MIC jack has priority.

If the AUDIO DUB indicator does not light

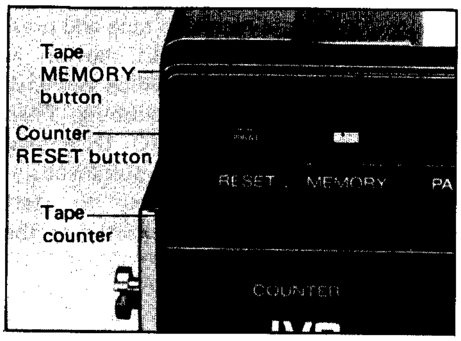
Check to see if the cassette safety tab is in place. If it has been broken and removed, reseal the slot with cellophane tape.

- If whistling or howling is heard during audio dubbing, reduce the TV volume or move the microphone farther away from the TV. Recording is being performed even if sound is not heard from the TV receiver. If you want to monitor the sound being recorded, connect the provided earphone to the EAR jack.

ADDITIONAL FACILITIES

Tape counter and tape memory function

When the MEMORY button is pressed, the tape will stop automatically in the Rewind and Fast Forward modes at the counter reading of "0". This facility is convenient when you wish to view a specific tape section repeatedly or the section that you have recorded just before.



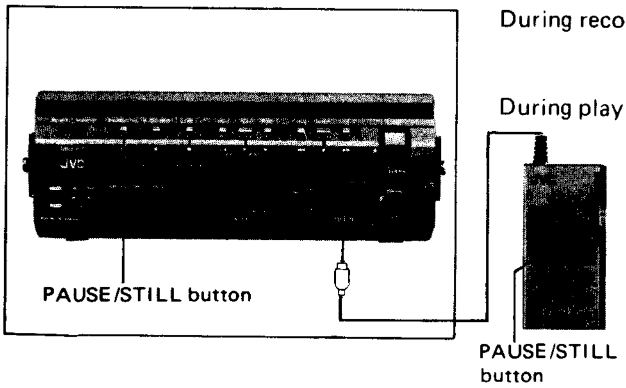
1. Reset the tape counter to "0" during playback or recording.
2. After playback or recording, press the MEMORY button. "M" will appear at the bottom left-hand corner of the tape counter display.
3. Press the REW button. The tape will rewind and stop at the counter reading of "0".
   - Depending on the situation, search for "0" is also possible by pressing the FF button.
4. Press the PLAY button to resume playback.

Notes

- If you wish to cancel the memory function once you have engaged the MEMORY button, simply press the MEMORY button again. The indication "M" will disappear.
- The Memory mode is automatically released with the indication "M" disappearing, when the tape stops at the counter reading of "0".
- While the tape is being wound in the forward direction (playback, recording, fast forward, etc.), the counter reading advances in the direction of increasing numbers, such as 0, 1, 2, 3 . . .
- While the tape is being wound in the reverse direction (rewind, etc.), the counter reading changes in the direction of decreasing numbers and after "0" a "minus" sign appears, such as 3, 2, 1, 0, -1, -2, -3 . . . . .

Pause facility

The PAUSE/STILL button permits stopping the tape temporarily during recording. While the tape is stationary, the input signals can be seen and heard. This facility is convenient to eliminate unwanted material from your recordings.



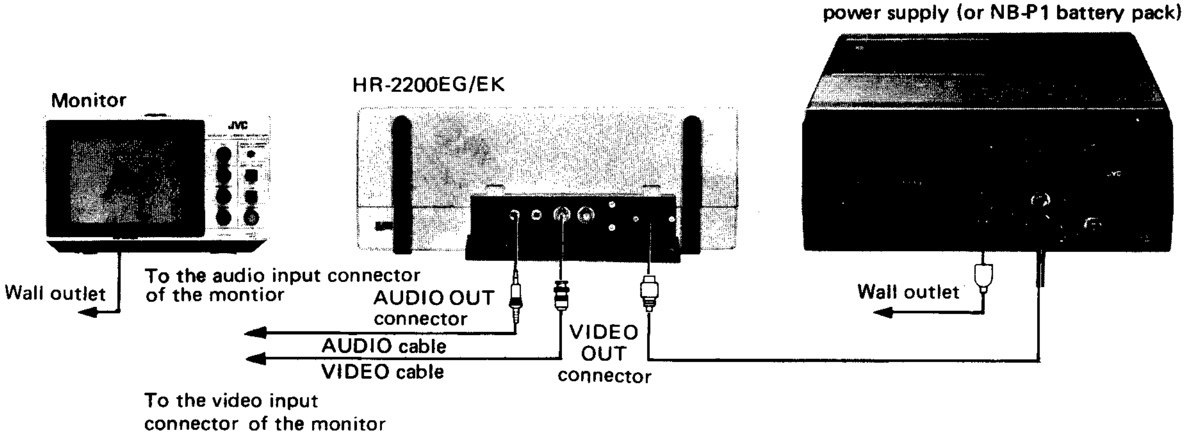
During recording	Employ the PAUSE/STILL button to stop the tape temporarily.
During playback	Employ the PAUSE/STILL button to view a still picture.

Notes

- If you continue the Pause or Still mode for longer than 5 minutes, the recorder automatically enters the Stop mode.
- To release the Pause or Still mode, press the PLAY button.

CONNECTING TO A VIDEO MONITOR

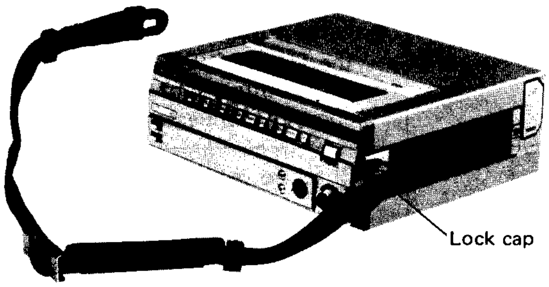
The HR-2200EG/EK can be connected to a video monitor. If you employ a portable monitor such as the JVC TM-41EG/EK, you can check your camera recordings on the spot.


AA-P22EG/EK or TU-22EG/EK for power supply (or NB-P1 battery pack)
Monitor
HR-2200EG/EK
Wall outlet
To the audio input connector of the montior
AUDIO OUT connector
AUDIO cable
VIDEO cable
VIDEO OUT connector
Wall outlet
To the video input connector of the monitor

Note

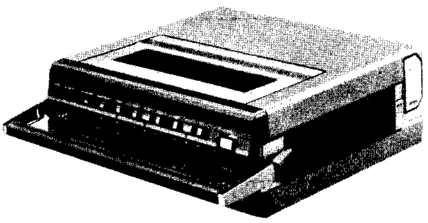
- For battery operation of the TM-41EG/EK, an exclusive battery pack (PBP-1) is needed.
- For recharging the PBP-1 battery pack, the optional AA-P41EG/EK is required.

ATTACHING THE SHOULDER STRAP OR CARRYING HANDLE



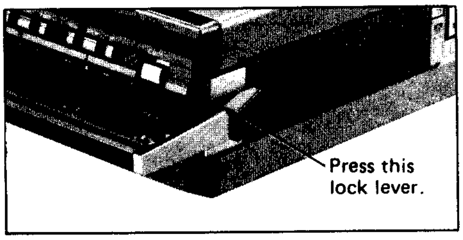
Attaching the shoulder strap

- Open the lock caps on both ends of the shoulder strap and hook the lugs onto the strap/handle retainers.
- Close the lock caps.
- To remove the shoulder strap, first open the lock caps.



Attaching the carrying handle

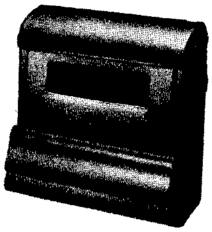
- Apply the carrying handle from the front of the recorder as illustrated.
- Then pull the handle forward. This allows it to be fixed to the strap/handle retainers.


Press this lock lever.

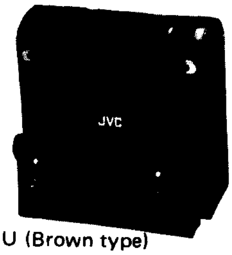
- To remove the handle, press the lock levers on both ends of the carrying handle and push the handle toward the rear of the unit.

CARRYING CASE AND SHOULDER CART (OPTIONAL)

Two different carrying cases are available for the HR-2200EG/EK.

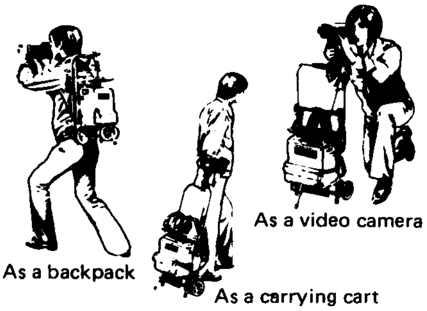


CB-P22SU (Silver-colour type)



CB-P22BU (Brown type)

The SC-P2U Shoulder Cart is a multi-purpose unit that can be used either as a carrying cart or a back-pack. Employ this unit for on-location recording.



IN CASE OF DIFFICULTY

Symptoms	Check points
No power is applied when the POWER button is pressed to ON.	● Is the battery pack correctly installed? ● Is the battery pack charged? ● Is the power cord of the AA-P22EG/EK or the TU-22EG/EK connected? ● Is the output cord of the AA-P22EG/EK or TU-22EG/EK correctly connected?
Rewinding or fast forwarding is impossible.	● Check to see if the tape has already been wound to one reel or the other fully.
Recording or audio dubbing is impossible.	● Check to see if the cassette safety tab is in place.
Recording of TV programmes is impossible.	● Is the EXT LINE IN/TUNER select switch on the rear panel of the HR-2200EG/EK set to TUNER?
Noise bars appear on the playback picture.	● Remove noise bars using the TRACKING controls. See page 19. ● Noise bars during shuttle search cannot be eliminated.

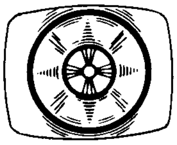
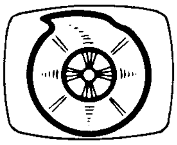
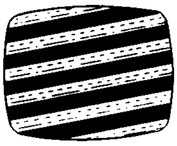
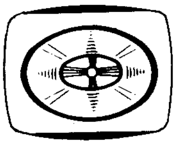
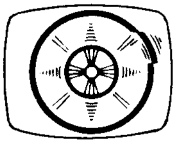
HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV programme received is clear. This does not mean that the recorded programme has been erased.
- Dirt accumulated on the video heads after long periods of usage causes such troubles. In this case, head cleaning requiring highly technical care is necessary.

For head cleaning, consult the nearest JVC dealer.

ADJUST YOUR TV RECEIVER WHEN...

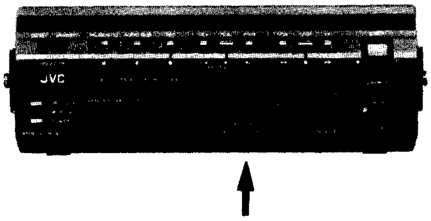
If your TV receiver shows the following symptoms during Still Playback or Slow-motion Playback using the HR-2200EG/EK, adjust the TV receiver first.

Symptom	Adjustment
Picture vibrates vertically. 	Turn the V-Hold knob slightly for stabilizing.*
The upper portion of the picture drifts horizontally. 	Turn the H-Hold knob slightly for stabilizing.**
Picture rolls. 	Turn the H-Hold knob slightly for stabilizing.**
Picture is flattened vertically. 	Inherent in your TV receiver. Not adjustable.
Only a portion of the picture continues to flicker. 	Inherent in your TV receiver. Not adjustable.

If the V-Hold and H-Hold knobs are not provided on your TV receiver, please consult the JVC store where you bought the HR-2200EG/EK or your local JVC dealer.

Note:

* If an unsatisfactory result is obtained, adjust a potentiometer under the small square cover located at the bottom of the unit so that a stable picture is obtained.



** If an unsatisfactory result is obtained, it is necessary to adjust the AFC circuit of the TV receiver.

SPECIFICATIONS

General

Power requirement : 12 V ⎓ DC
Power consumption : 9.6 watts
Weight : 5.2 kg including battery pack
4.4 kg without battery pack
Dimensions : 28.8(W) x 10.3(H) x 26.8(D) cm
Temperature
  Operating : 0° to 40°
  Storage : -20° to 60°C

Tape section

Format : VHS standard
Video signal system : PAL-type colour and monochrome signal, 625 lines
Video recording system : Rotary, slant azimuth, two-head helical scanning system
Tape width : 12.7 mm
Tape speed : 23.39 mm/sec.
Maximum recording time : 180 min. (with JVC E-180 cassette)
Rewind and fast forward time : Within 5 minutes (with JVC E-180 cassette)
Video signal
  Input : 0.5 to 2.0 Vp-p, 75 ohms unbalanced
  Output : 1.0 Vp-p, 75 ohms unbalanced
  Horizontal resolution : More than 240 lines (colour mode)
  Signal-to-noise ratio : More than 43 dB (Rohde & Schwarz noise meter)
Audio signal
  Microphone input : -67 dBs, high impedance, unbalanced
  Line input : -20 dBs, 50 k-ohms, unbalanced
  Line output : -6 dBs, less than 1 k-ohm, unbalanced
  Earphone output : 0 dBs, 100 ohms, unbalanced
  Frequency response : 100 to 8 000 Hz
  Signal-to-noise ratio : More than 40 dB

RF section

RF output channel : UHF channels 32 – 40
Output impedance : 75 ohms unbalanced

Accessories

Provided : Remote control unit, aerial cable, shoulder strap, carrying handle, earphone
Optional : NB-P1 Battery pack
CB-P22SU/BU Carrying bag
SC-P2U Shoulder cart
AP-P2E Car battery cord

Design and specifications subject to change without notice.

SECTION 2
MECHANISM DESCRIPTION

2.1 GENERAL

This model features simplified mechanical construction in comparison to earlier machines in the VHS series.
The chassis for supporting mechanical parts is made of FRP (fiber reinforced plastics) for further enhancing the unit's portability with its lightness.

The rotating video head drum is directly driven by a DC motor. A total of four motors are used in the system. The various interactions of the electronic and mechanical components are controlled by a microprocessor, which contributes to precise and reliable operation.

A description of the main mechanical functions is provided below.

2.2 MAIN COMPONENT FUNCTIONS

1. Drum motor
   A direct drive (DD) motor is used in conjunction with a servo circuit to control video head rotation.
2. Capstan motor
   The capstan motor regulates tape motion during record, play and slow modes. Its rotation is transmitted via the capstan belt to the capstan flywheel.
3. Reel motor
   A shifting idler is employed for transmitting the reel motor rotation to the supply and take-up reel disks. Rotation of the motor is bidirectional and performs tape take-up or supply in the record, play, shuttle search (S-FWD and S-REV), slow fast forward (FF), and rewind modes.

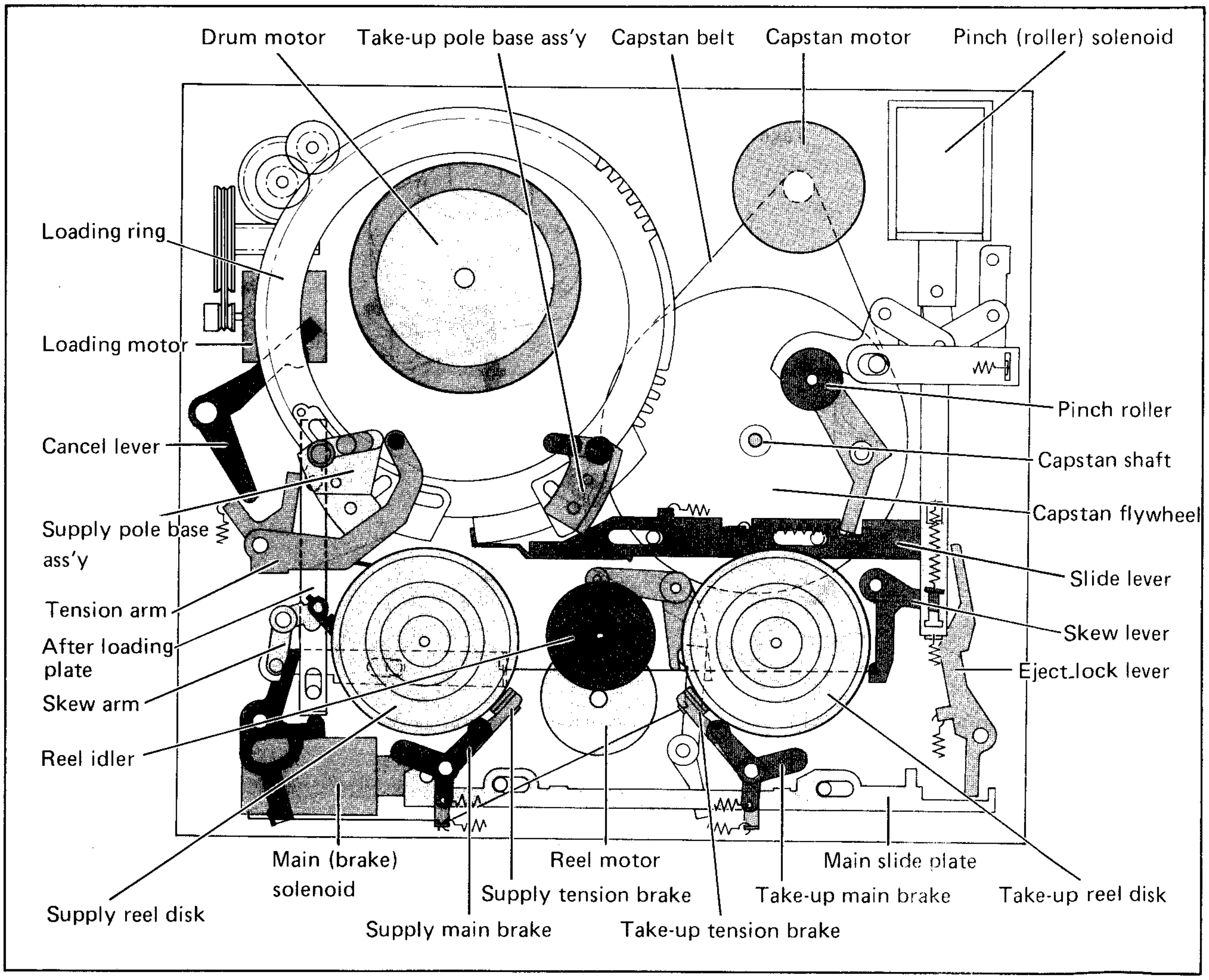

Drum motor
Take-up pole base ass'y
Capstan belt
Capstan motor
Pinch (roller) solenoid
Loading ring
Loading motor
Cancel lever
Supply pole base ass'y
Tension arm
After loading plate
Skew arm
Reel idler
Pinch roller
Capstan shaft
Capstan flywheel
Slide lever
Skew lever
Eject lock lever
Main (brake) solenoid
Reel motor
Main slide plate
Supply reel disk
Supply tension brake
Take-up main brake
Take-up reel disk
Supply main brake
Take-up tension brake

Fig. 2-1 Main part locations

4. Loading motor
   This motor is also bidirectional and functions to extract the tape from the cassette during loading and return it to the cassette during unloading.
5. Main solenoid
   According to the selected mode, the main solenoid functions to engage or release the main brakes, eject lock, reel idler mechanisms and brake switch.
6. Pinch roller solenoid
   This solenoid engages and releases the pinch roller pressure, tension band pressure and pinch switch.

2.3 MAIN COMPONENT OPERATIONS

2.3.1 Main solenoid

The main solenoid operates in all modes except the stop mode. Activation of the solenoid produces the following states.

1. Main brake release (Fig.2-2)
   The solenoid plunger moves the main slide plate toward the left. Via the studs, this releases the main brakes from the supply and take-up reel disks.
2. Eject lock (Fig. 2-2)
   Shifting the main slide plate toward the left moves the eject lock lever to the right and locks the cassette housing. After loading completion, the slide lever restrains the eject lock lever. (See pinch roller 2.3.4.)

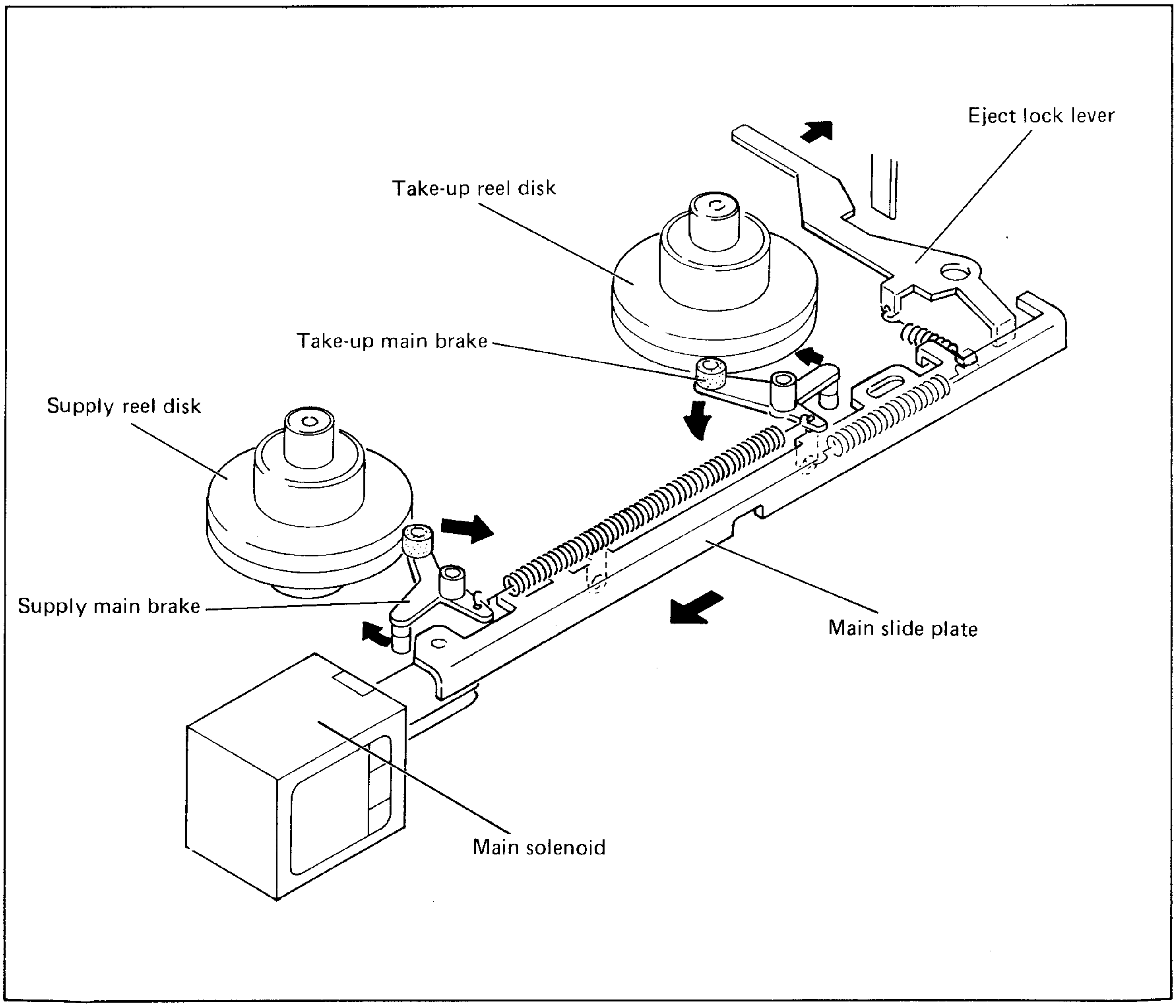

Eject lock lever
Take-up reel disk
Take-up main brake
Supply reel disk
Supply main brake
Main slide plate
Main solenoid

Fig. 2-2 Main brakes and eject lock

3. Reel disk drive (Fig. 2-3)
   With the main solenoid off, a spring pulls the main slide plate toward the right. A notch of the main slide plate controls idler lever-3. The reel idler assembly is regulated both in the lateral direction by the stud of idler lever-3 and in the longitudinal direction by a leaf spring.

   When the main solenoid is energized, the main slide plate overcomes the force of the spring and moves toward the left. This causes idler lever-3 to also move toward the left. The stud of idler lever-3 moves toward the right, freeing the reel idler assembly. At this time, when the rotational force of the reel motor overcomes the leaf spring, the reel idler assembly is forcibly brought into contact with the supply or take-up reel disk (depending on the rotating direction). As the motor continues to rotate, the reel disk also rotates.

4. Brake switch on
   When the main solenoid operates, the main slide plate sets brake switch on.

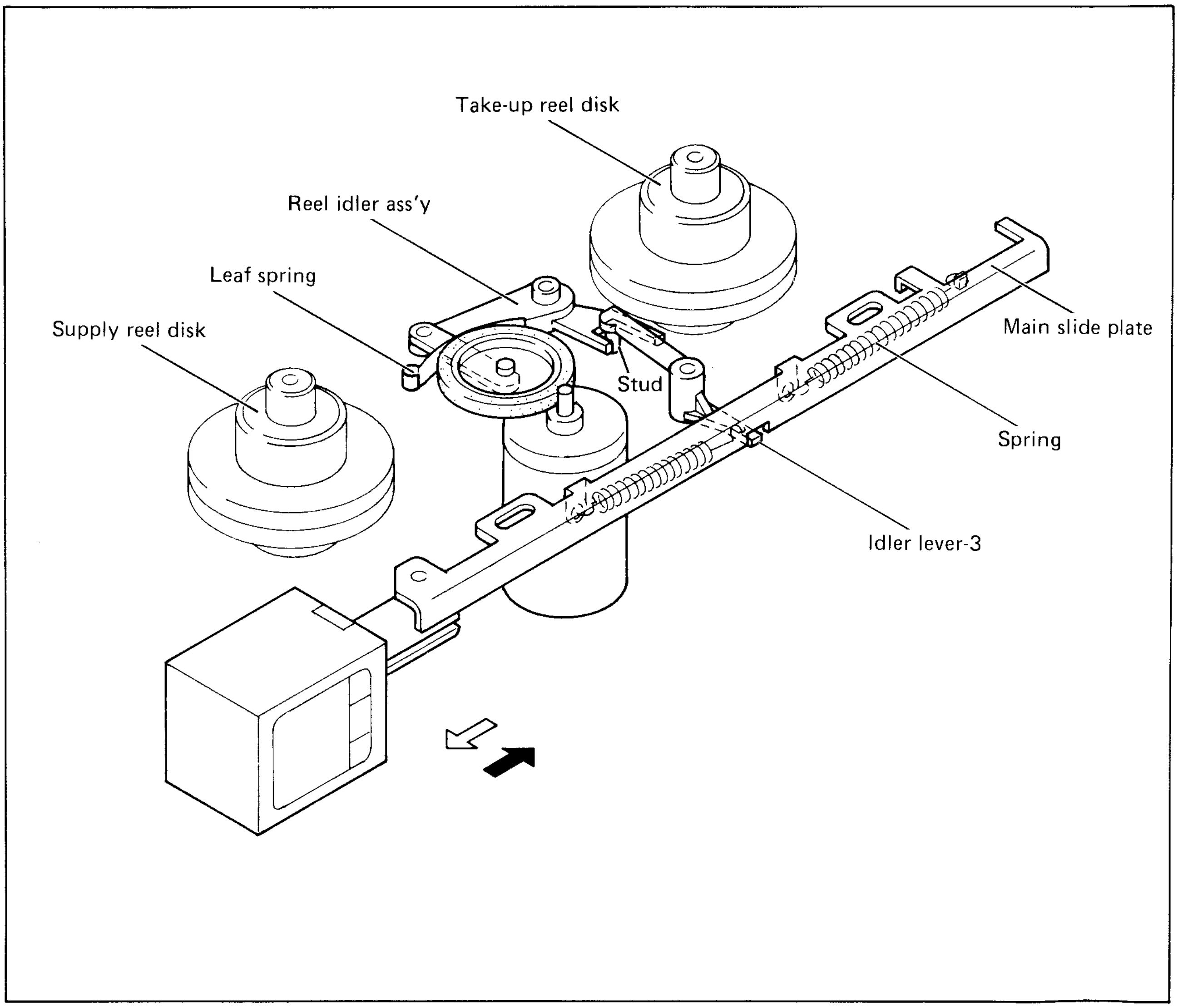

Take-up reel disk
Reel idler ass'y
Leaf spring
Supply reel disk
Main slide plate
Stud
Spring
Idler lever-3

Fig. 2-3 Reel disk drive

2. 3. 2 Loading motor

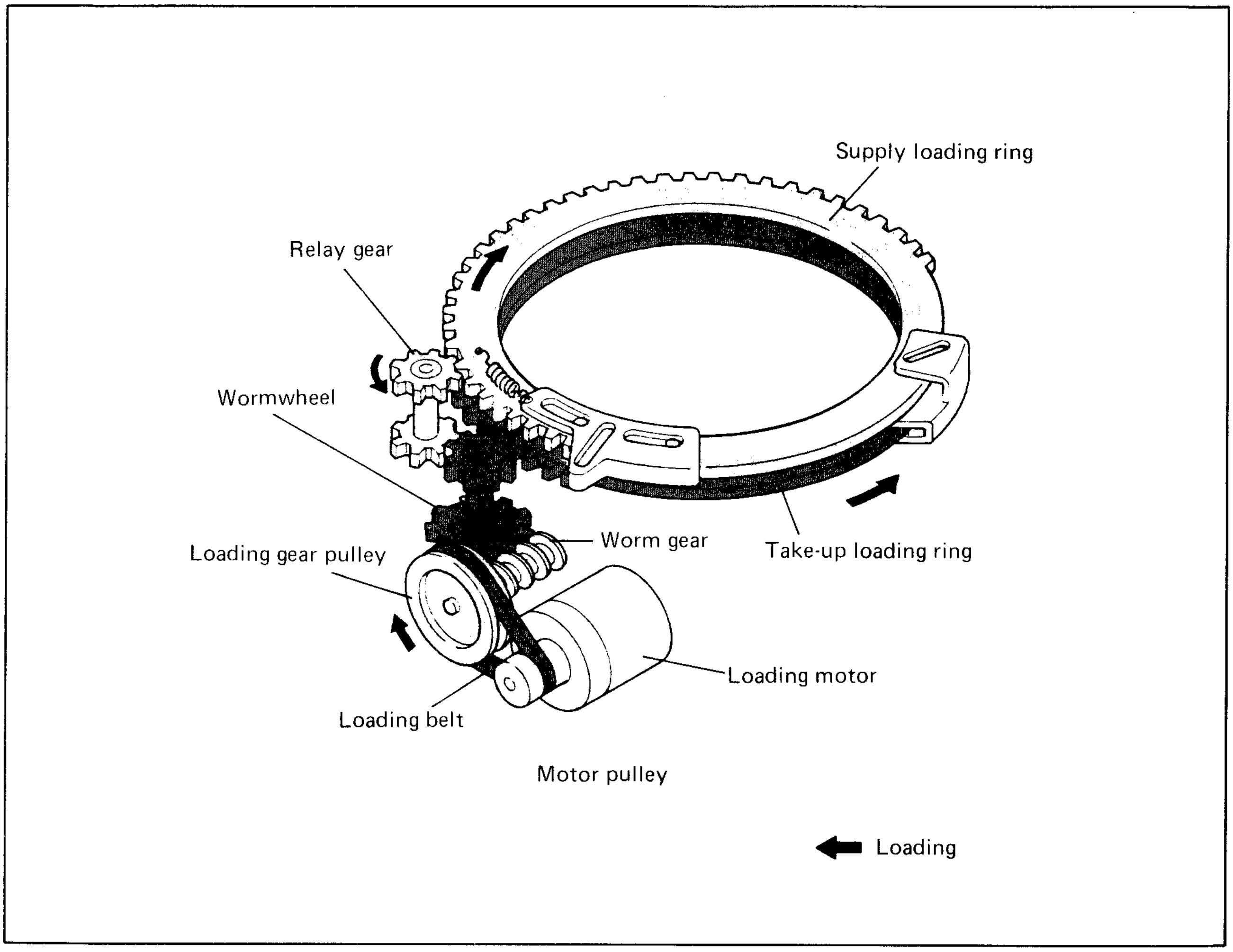

Supply loading ring
Relay gear
Wormwheel
Loading gear pulley
Worm gear
Take-up loading ring
Loading motor
Loading belt
Motor pulley
Loading

Fig. 2-4 Loading motor

The loading motor rotates only during the loading and unloading modes. As can be noted from the figure, the rotation is transmitted in the route: loading motor → motor pulley → loading belt → loading gear pulley → worm gear → wormwheel, then to the take-up loading ring and via the relay gear to the supply loading ring. The loading rings then rotate.

2. 3. 3 Loading rings

1. A slide ring is included with the supply loading ring, as shown in the figure. The pin of the supply pole base rides in the slot of the slide ring.
   Tape is extracted from the cassette by the guide pole and guide roller.
2. Similarly, the take-up loading ring also includes a slide ring and functions to wrap the tape about the head drum. Loading ring movement shifts the slide lever and pinch roller operation begins.

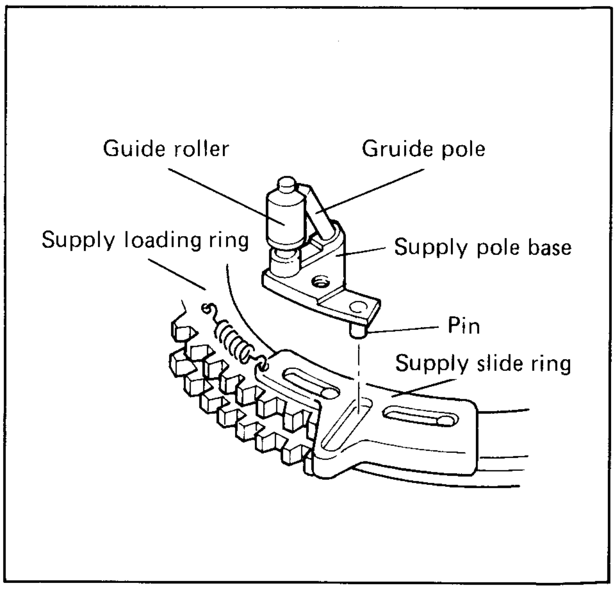

Guide roller
Gruide pole
Supply loading ring
Supply pole base
Pin
Supply slide ring

Fig. 2-5 Supply loading ring

2.3.4 Pinch roller

The take-up slide ring moves the slide lever toward the left, then with rotation of the take-up loading ring, spring-A moves the slide lever toward the right. This shifts the pinch roller arm assembly to where the pinch roller nearly contacts the capstan shaft. At this time, the eject lock mechanism is held in the locked position.

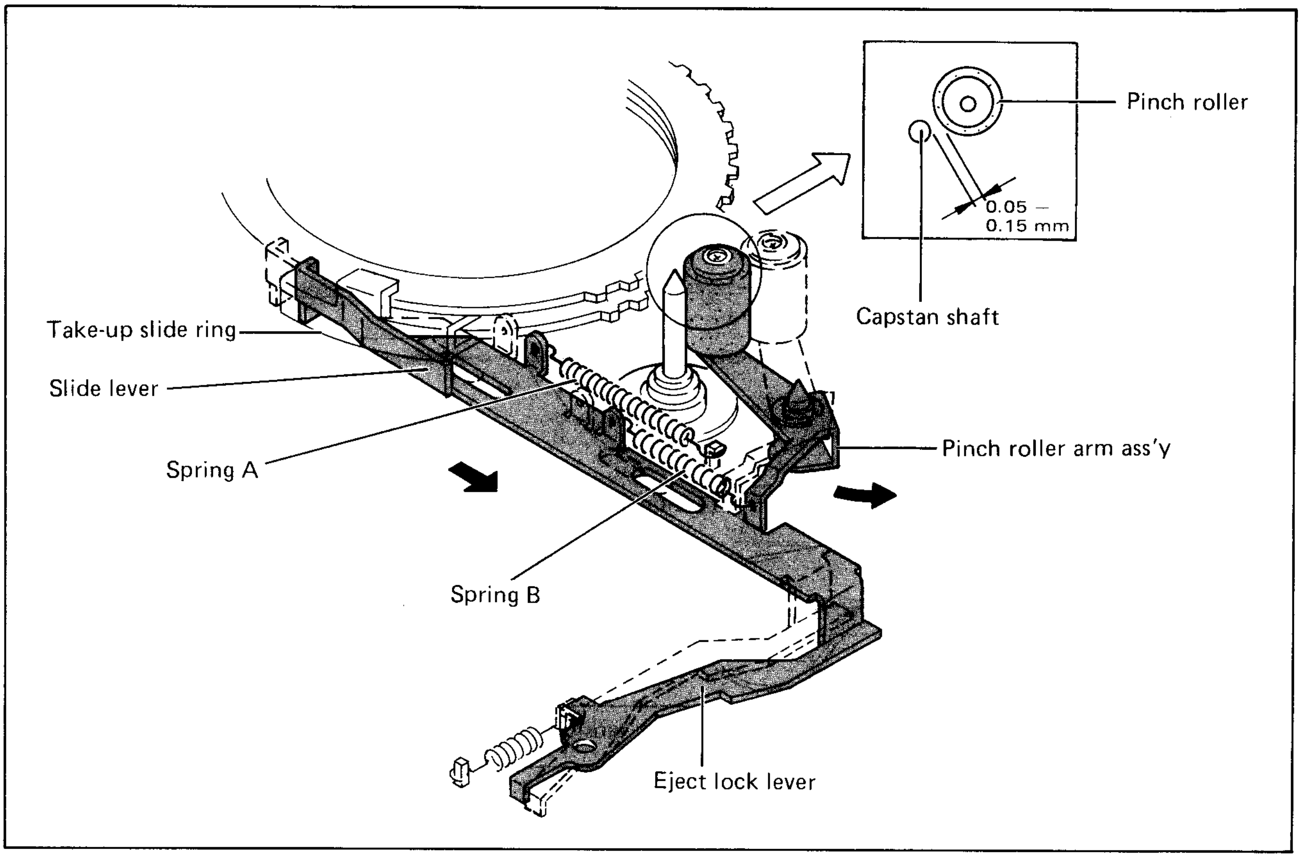

Pinch roller
0.05 – 0.15 mm
Capstan shaft
Take-up slide ring
Slide lever
Spring A
Pinch roller arm ass'y
Spring B
Eject lock lever

Fig. 2-6 Pinch roller operation-1

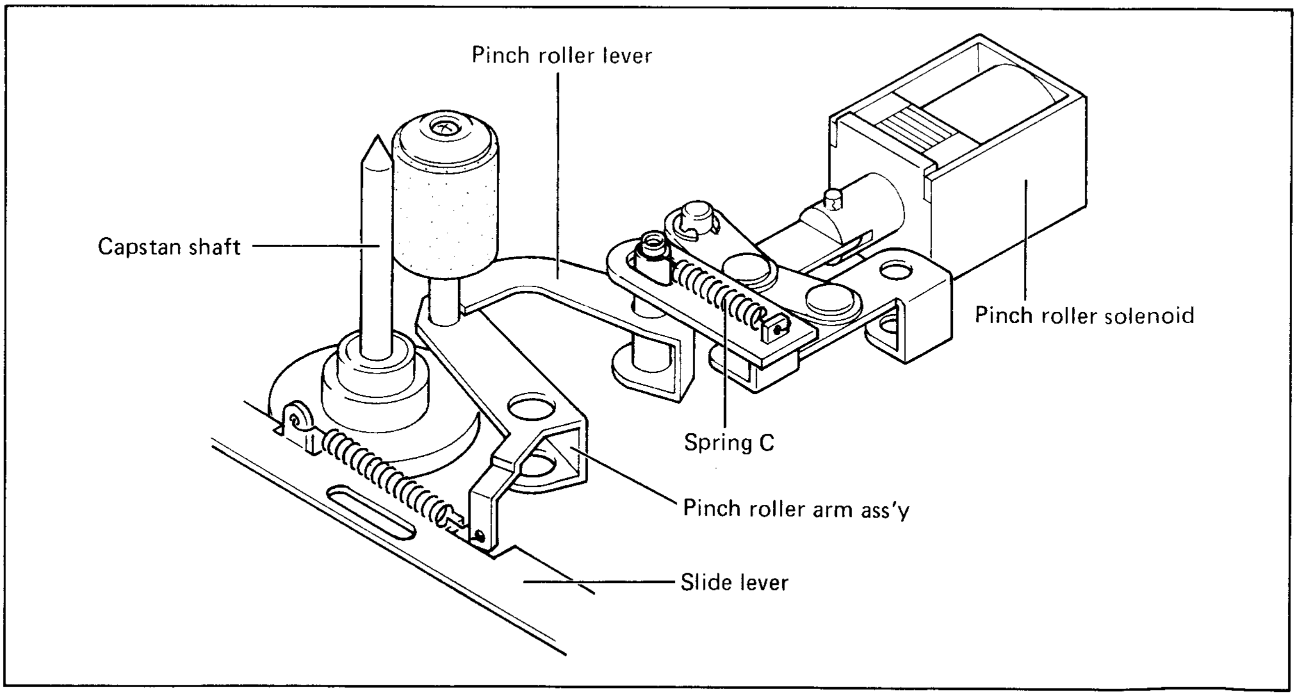

Pinch roller lever
Capstan shaft
Pinch roller solenoid
Spring C
Pinch roller arm ass'y
Slide lever

Fig. 2-7 Pinch roller operation-2

As the loading drive ring turns to about 1/6th of its travel, the pinch roller becomes nearly engaged.
Rotation ends at approximately the 90° position (AL switch on), at which time the pinch roller solenoid is switched on. Via the pinch roller lever and pinch roller arm assemblies, the pinch roller is pressed against the capstan shaft. Spring-C determines the pinch roller Pressure. See Fig. 2-7.

2. 3. 5 Back tension and tension brakes

As the supply pole base shifts in the loading direction, the tension pole is brought to position A (Fig. 2-8). Rotation of the take-up loading ring (lower side) engages the cancel lever with the loading ring stud, releasing the tension arm lock. A spring then shifts the tension arm fully toward the left.

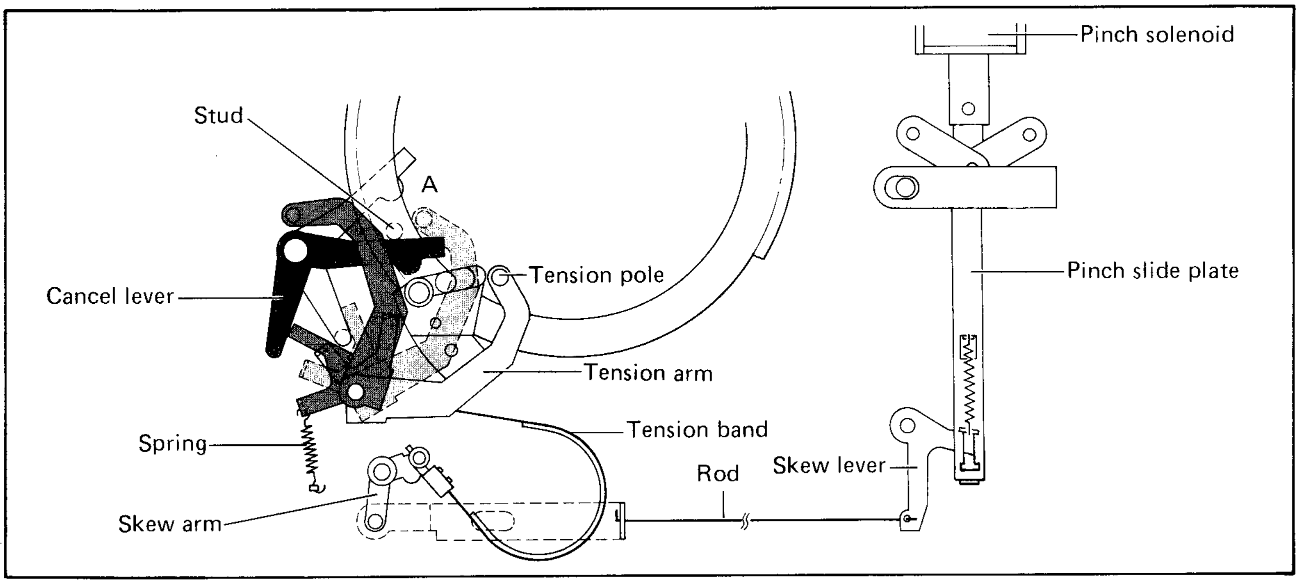

Pinch solenoid
Stud
A
Cancel lever
Tension pole
Pinch slide plate
Tension arm
Tension band
Spring
Rod
Skew lever
Skew arm

Fig. 2-8 Back tension

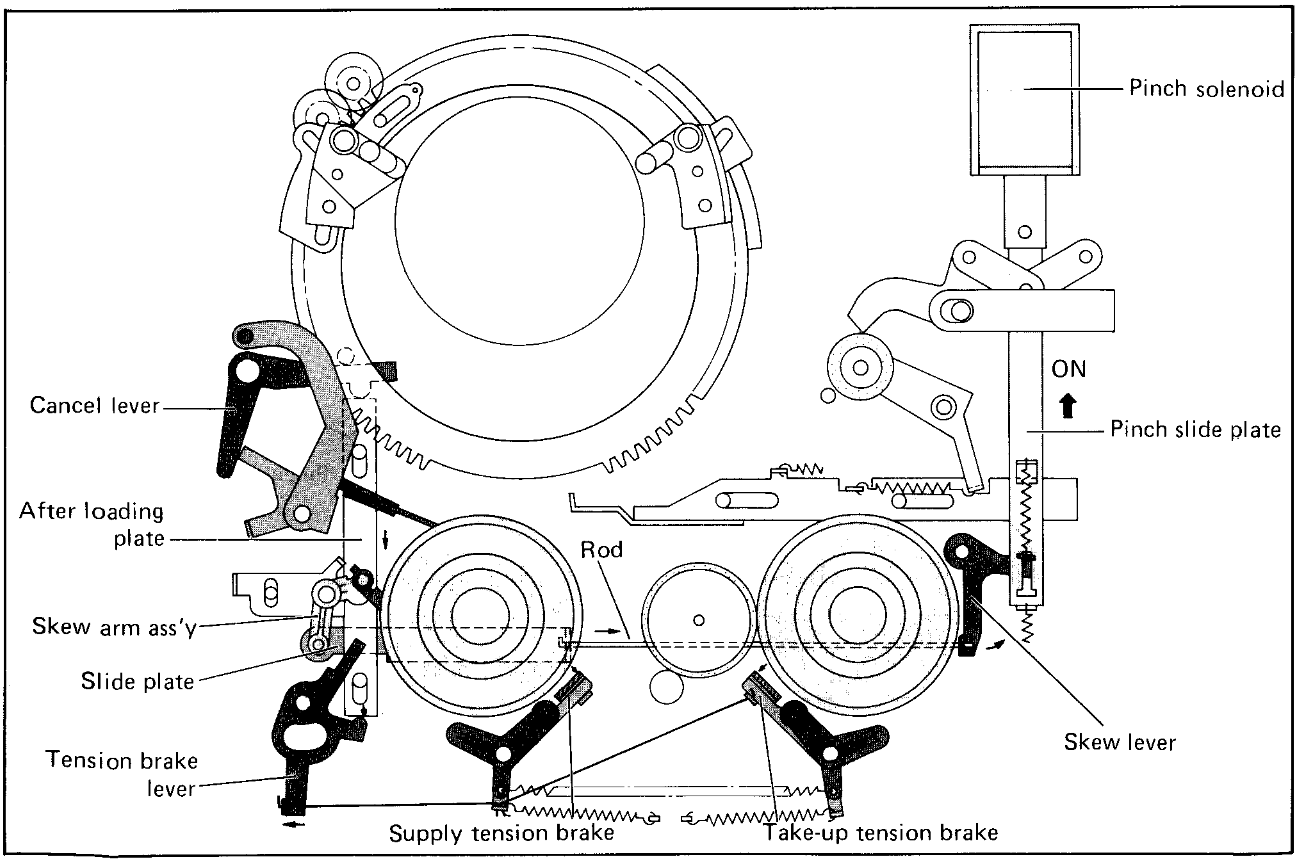

Pinch solenoid
Cancel lever
ON
Pinch slide plate
After loading plate
Rod
Skew arm ass'y
Slide plate
Skew lever
Tension brake lever
Supply tension brake
Take-up tension brake

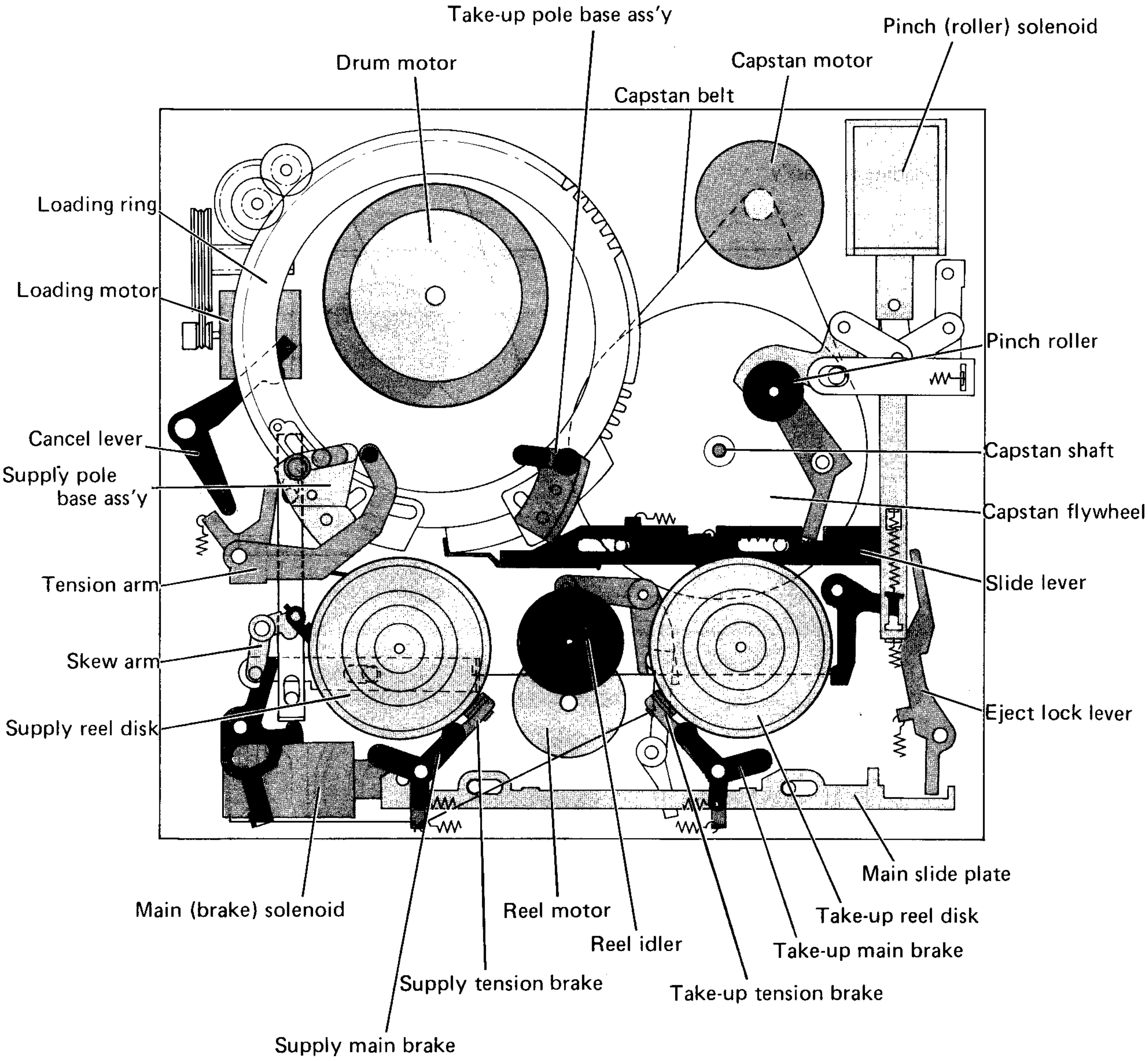
Fig. 2-9 Tension brake

This completes the loading operation, at which time the after loading plate sets the AL switch on and the pinch roller solenoid is energized. The solenoid plunger operates pinch slide plate, skew lever, slide plate and skew arm to apply back tension. After loading plate is moved by the cancel lever, and the tension brake lever rotates to release the tension brakes. See Figs. 2-8 and 2-9.

2.4 MODE DESCRIPTIONS

2.4.1. Stop mode

In the stop mode, no operations are being initiated. The idler assembly is stopped and held in the neutral position and does not contact either reel disk.



Take-up pole base ass'y
Pinch (roller) solenoid
Drum motor
Capstan motor
Capstan belt
Loading ring
Loading motor
Pinch roller
Cancel lever
Supply pole base ass'y
Capstan shaft
Capstan flywheel
Tension arm
Slide lever
Skew arm
Supply reel disk
Eject lock lever
Main slide plate
Main (brake) solenoid
Reel motor
Take-up reel disk
Reel idler
Take-up main brake
Supply tension brake
Take-up tension brake
Supply main brake

Fig. 2-10 Stop mode

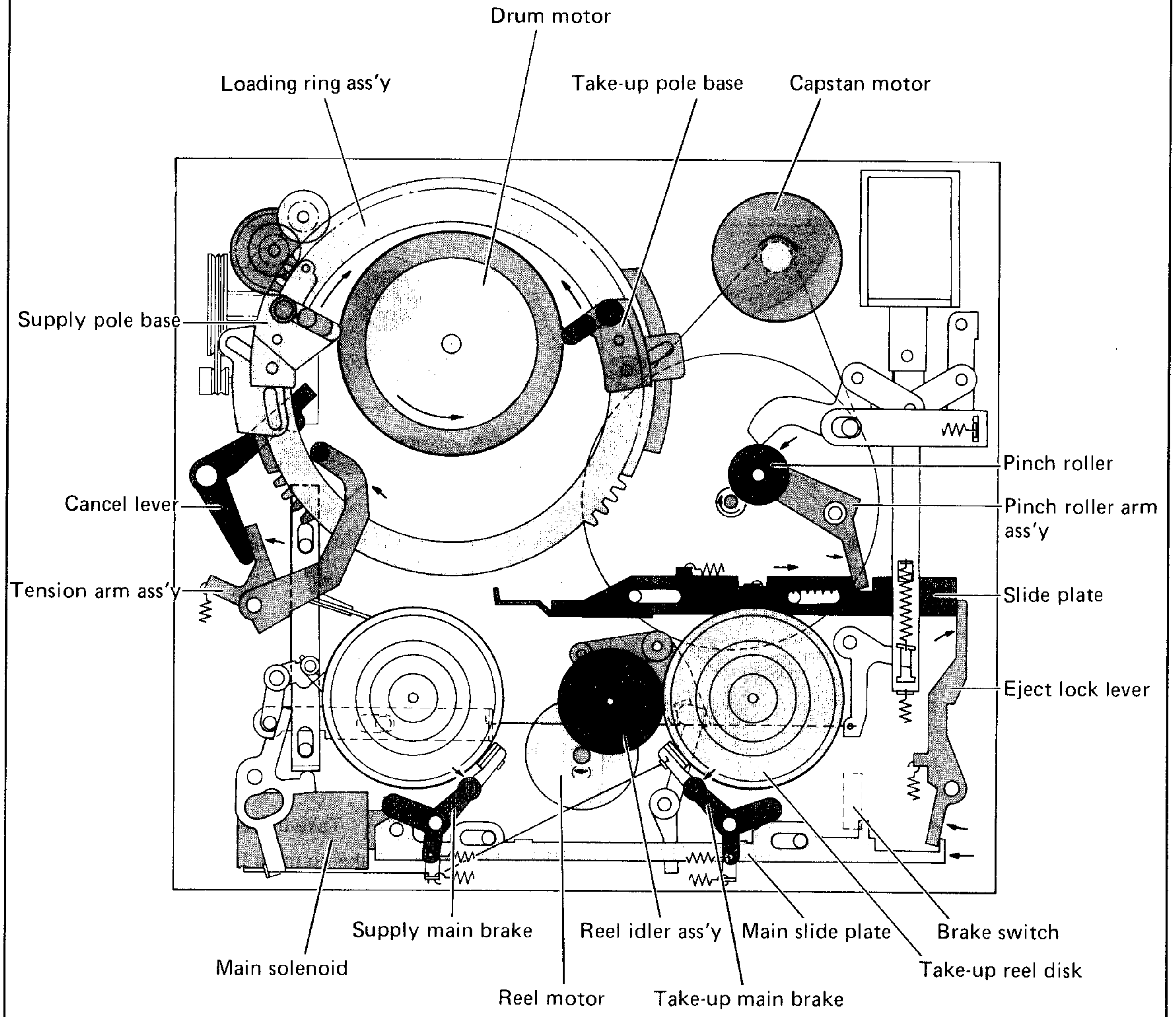
2. 4. 2 Loading and unloading

1. Loading mode

   Clockwise rotation of the reel motor begins when the PLAY button is pressed. The main solenoid operates and releases the main brakes. When the brake switch closes, the reel motor stops, then the drum, capstan and loading motors begin rotating. A brief clockwise rotation of the reel motor shifts the idler assembly to where it contacts the take-up reel disk assembly. This also ensures proper seating of the cassette internal reels on the reel disks.

   As the loading motor rotates, the pole bases of the loading ring assembly gradually extract the tape from the cassette. The supply pole base also moves and the tention arm assembly shifts to the cancel lever position. Rotation of the take-up loading ring assembly releases the slide lever which then moves toward the right. Via the pinch roller arm assembly, the pinch roller becomes positioned 0.05 to 0.15 mm from the capstan shaft.

   The slide lever locks the eject lock lever, which in turn locks the cassette housing. Thus, the cassette housing is locked by both the main slide plate and the slide lever. (See 2.3.1 and 2.3.4).



Drum motor
Loading ring ass'y
Take-up pole base
Capstan motor
Supply pole base
Cancel lever
Tension arm ass'y
Pinch roller
Pinch roller arm ass'y
Slide plate
Eject lock lever
Supply main brake
Main solenoid
Reel idler ass'y
Main slide plate
Brake switch
Take-up reel disk
Reel motor
Take-up main brake

Fig. 2-11 Loading mode

2. Unloading mode

During the play mode, pressing the STOP button stops the capstan motor and releases the main solenoid. The main brakes are applied to the reel disks and the idler returns to the neutral position. Release of the main solenoid switches off the brake switch and releases the pinch solenoid, separating the pinch roller from the capstan shaft. Via the rod, the skew arm moves to separate the tension band from the supply reel disk.

At this time, the skew lever sets the pinch switch off, the reel motor turns counter-clockwise and the main solenoid again functions to release the main brakes. Idler rotation is then applied to the supply reel disk.

When the main solenoid operates, the brake switch closes and the loading motor begins rotating to initiate the unloading mode. As the loading ring starts turning, the cancel lever and after loading plate return to original positions. The tension arm is returned by the cancel lever and the after loading plate applies braking to the reel disks via the tension brake lever and the tension brakes. At a point just before completion of unloading, the slide lever starts to return to its original position, causing a large displacement of the pinch roller arm. Unloading is complete when the UL switch closes and the loading motor stops.

At completion of unloading, the reel motor stops, the main solenoid is released and the idler returns to the neutral position.

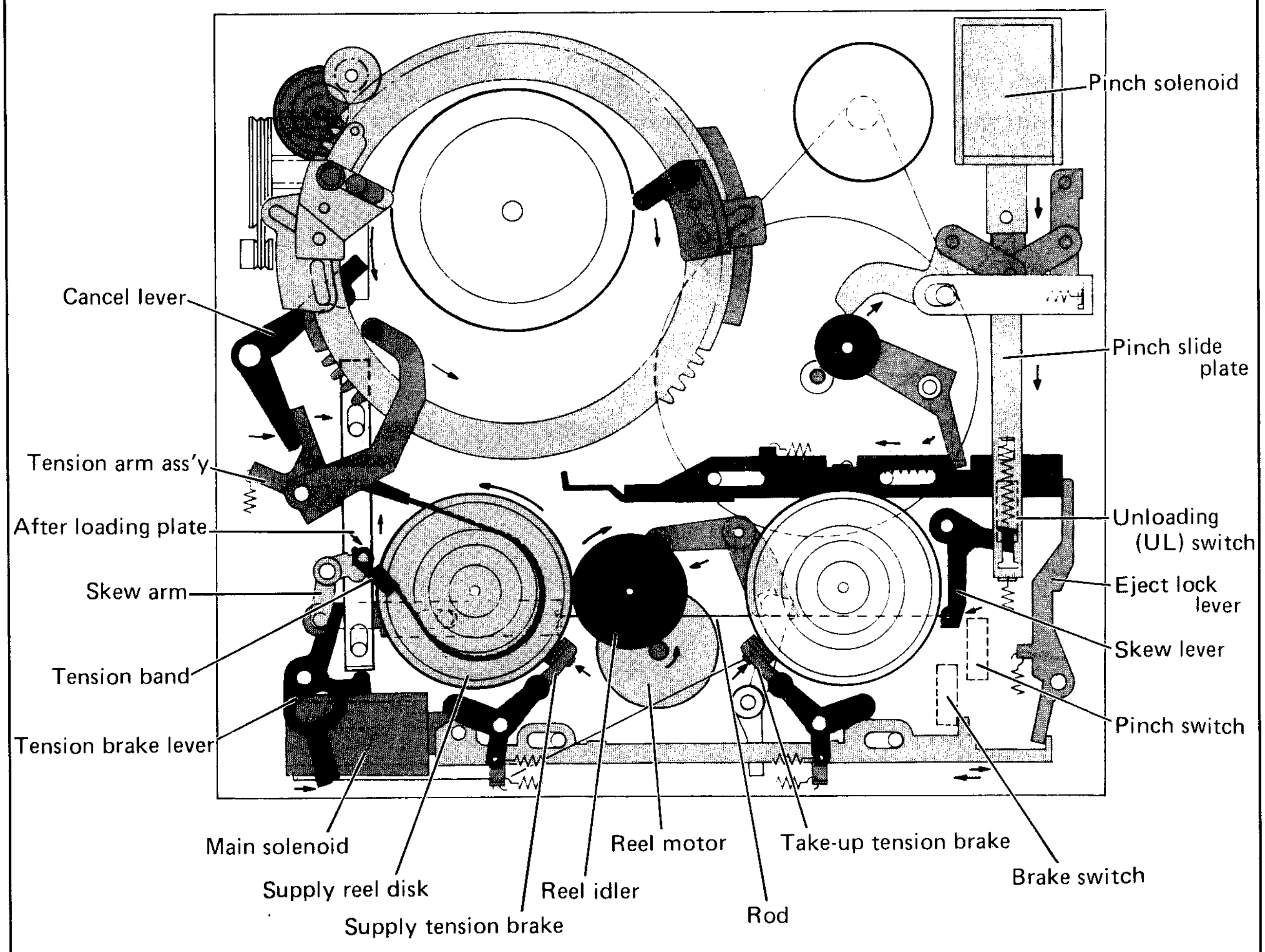

Pinch solenoid
Cancel lever
Pinch slide plate
Tension arm ass'y
After loading plate
Unloading (UL) switch
Skew arm
Eject lock lever
Skew lever
Tension band
Pinch switch
Tension brake lever
Main solenoid
Reel motor
Take-up tension brake
Brake switch
Supply reel disk
Reel idler
Rod
Supply tension brake

Fig. 2-12 Unloading mode

2.4.3 Play mode

1. Normal play mode
   Immediately before completion of loading, the stud below the take-up loading ring contacts the cancel lever and this presses the after loading plate. The cancel lever shifts the tension arm fully toward the left. After loading plate movement releases the tension brakes from the reel disks. When the after loading (AL) switch closes, the loading motor stops to complete loading.

   At this time, the pinch solenoid operates and the reel motor rotates clockwise. The pinch roller lever presses the pinch roller against the capstan shaft to initiate tape transport. The skew arm also moves to retain one end of the tension band.

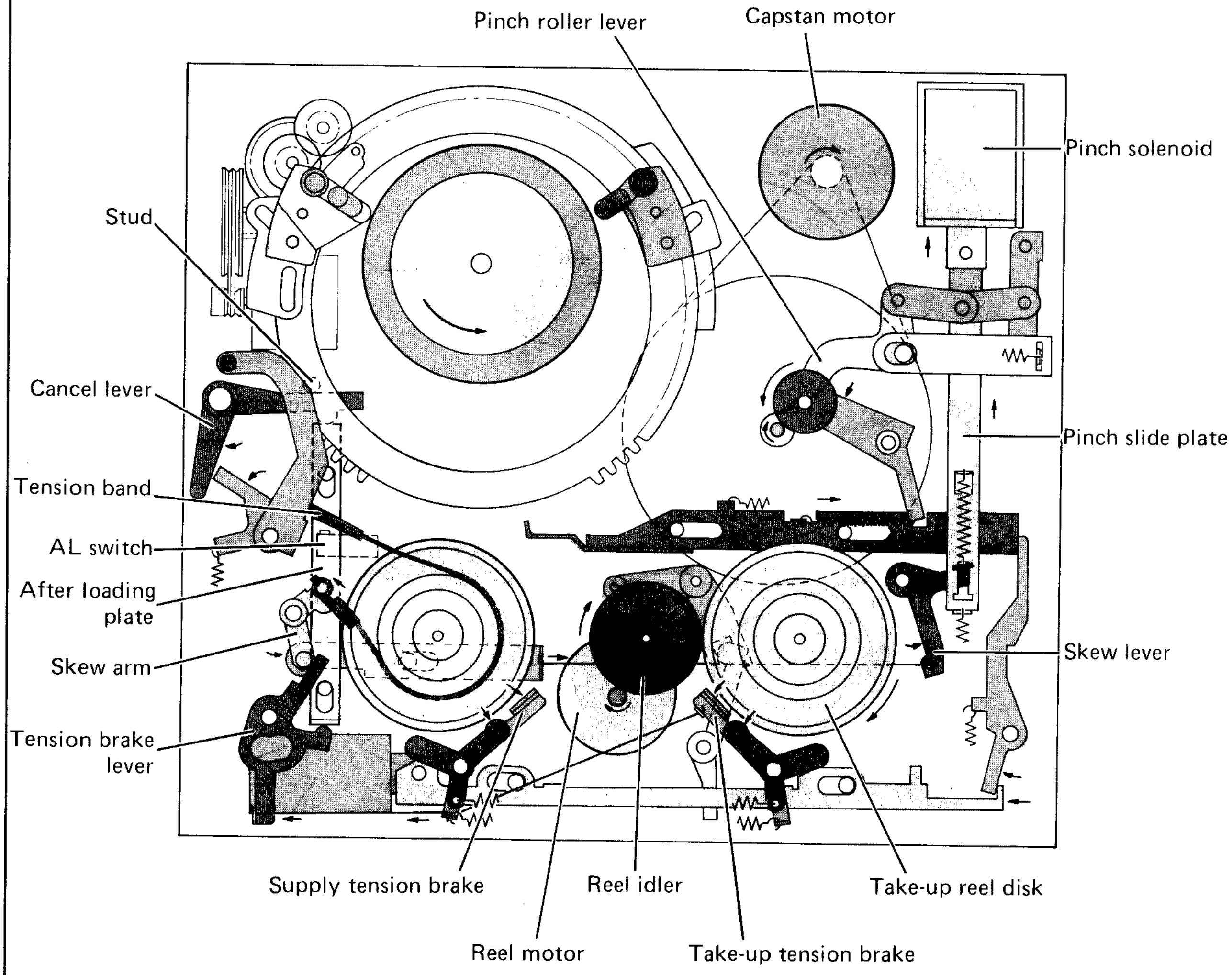

Pinch roller lever
Capstan motor
Pinch solenoid
Stud
Cancel lever
Pinch slide plate
Tension band
AL switch
After loading plate
Skew arm
Skew lever
Tension brake lever
Supply tension brake
Reel idler
Take-up reel disk
Reel motor
Take-up tension brake

Fig. 2-13 Normal play mode

2. Shuttle search forward (S-FWD)
   In the play mode, while the S-FWD button is held depressed, release of the pinch solenoid separates the pinch roller from the capstan shaft and the tension band from the supply reel disk. The pinch switch opens and the reel motor speed increases. This produces the S-FWD mode in which the tape is transported by the take-up reel, instead of the capstan and pinch roller.

   Releasing the S-FWD button disengages the main solenoid and the reel motor stops. The reel idler separates from the take-up reel disk and the main brakes briefly stop the reel disks. The brake switch is switched off and the reel motor rotates, and after about 150 msec the main solenoid sets the brake switch on. This operation shifts the reel idler to the take-up reel disk again. With the brake switch on, the pinch solenoid operates to press the pinch roller against the capstan shaft and secure the tension band. The normal play mode then resumes.

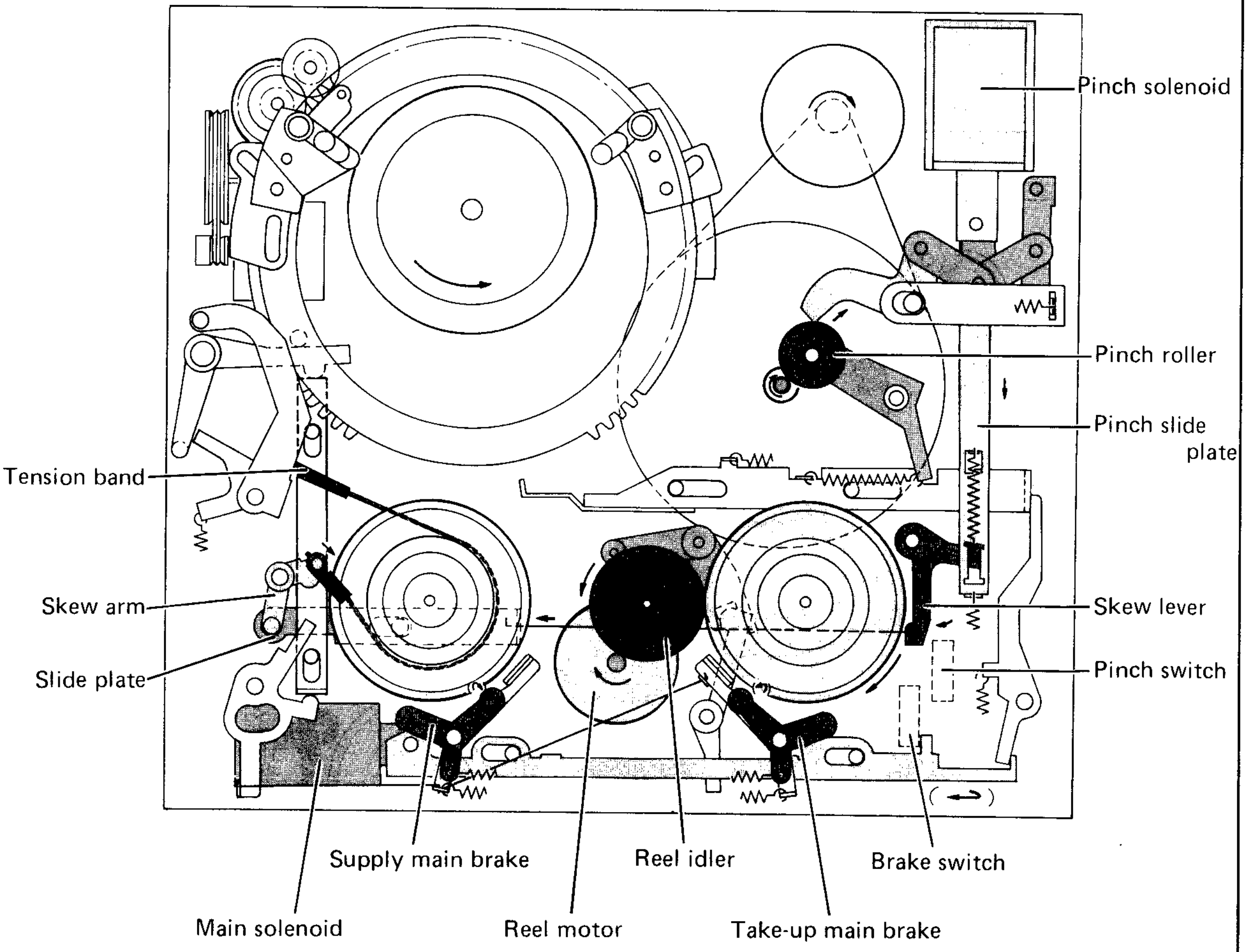

Pinch solenoid
Pinch roller
Pinch slide plate
Tension band
Skew arm
Skew lever
Slide plate
Pinch switch
Supply main brake
Reel idler
Brake switch
Main solenoid
Reel motor
Take-up main brake

Fig. 2-14 S-FWD mode

3. Shuttle search reverse (S-REV)
Holding the S-REV button depressed during the play mode releases the pinch and main solenoids. The pinch solenoid separates the pinch roller from the capstan shaft and the tension band from the supply reel disk. The pinch switch is then cut off.

The main solenoid brakes the reel disks to stop rotation and cuts off the brake switch. After 150 msec, the main solenoid again switches the brake switch on. During this interval, the reel motor rotates counter-clockwise to shift the idler to the supply reel disk. This produces the S-REV mode. Operations after releasing the S-REV button are the same as for S-FWD release.

4. Slow and still modes
Mechanically, these are the same as the play mode except for the different rotation rates of the capstan motor.

5. Pause mode
During the recording mode, pressing the PAUSE/STILL button releases the pinch and main solenoids. The pinch roller separates from the capstan shaft, tape transport stops and with the pinch switch off, the reel motor stops. At this time, the main solenoid applies brakes to the reel disks and the idler separates to yield the pause mode.

The pause mode is released by again pressing the PLAY button. Both main and pinch solenoids are energized. The main solenoid releases the main brakes and the brake switch closes, after which the reel motor rotates clockwise. The reel idler then contacts the take-up reel disk. At this time the pinch roller contacts the capstan shaft and the tension band is secured. The recording mode then resumes.

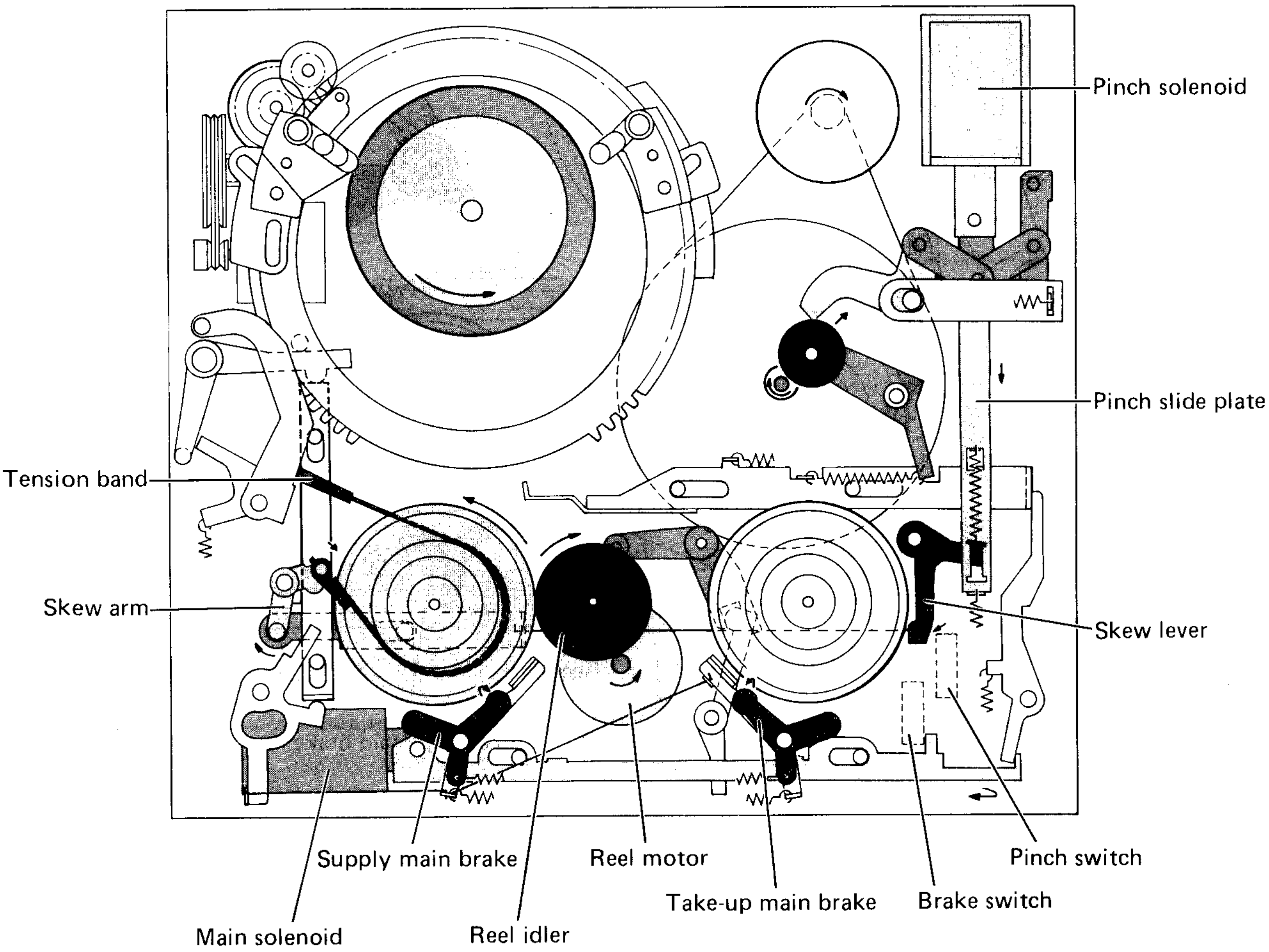


Fig. 2-15 S-REV mode

2.4.4 Fast forward (FF) mode

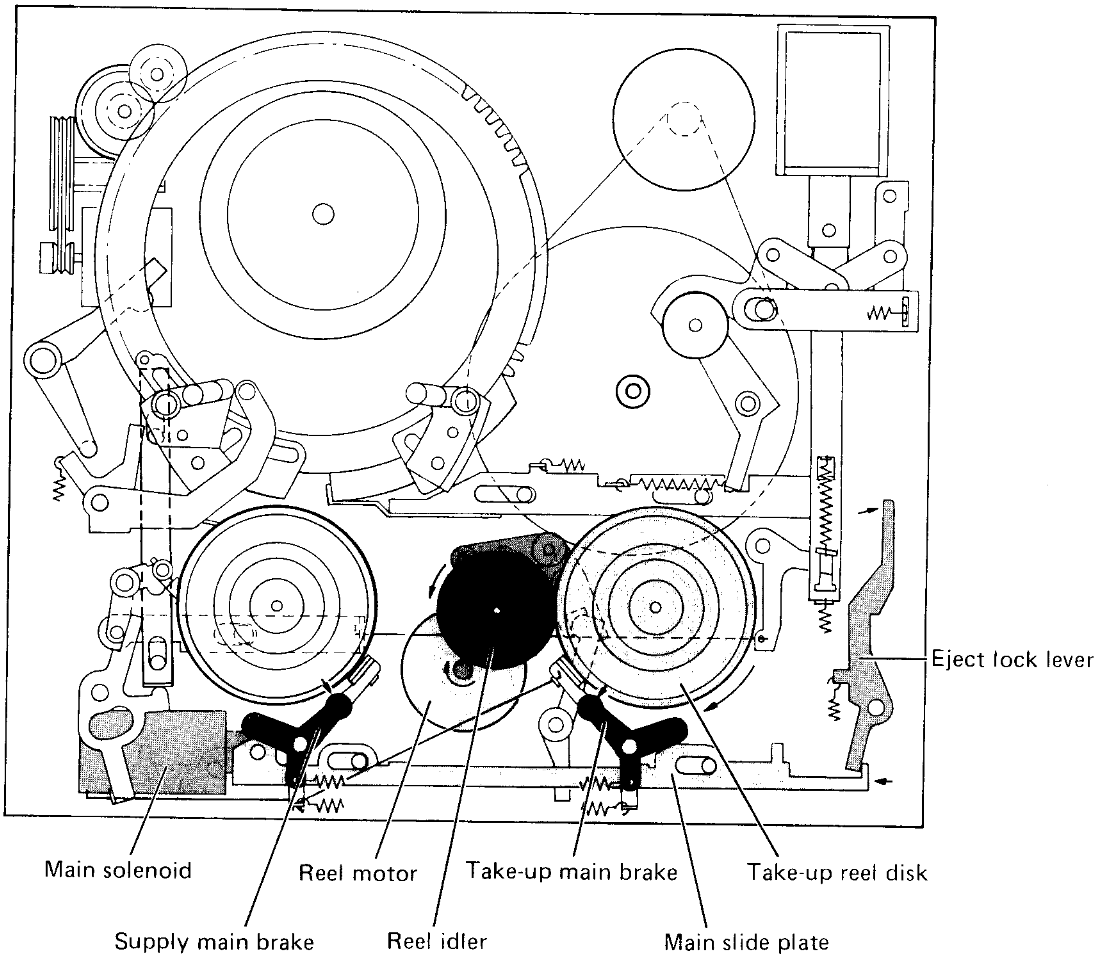

Eject lock lever
Main solenoid
Reel motor
Take-up main brake
Take-up reel disk
Supply main brake
Reel idler
Main slide plate

Fig. 2-16 FF mode

When the FF button is pressed, the reel motor rotates clockwise. The main solenoid operates and the reel idler is applied to the take-up reel disk. At this time, the main brakes are released from the reel disks and the tape becomes transported in the fast forward mode.

2.4.5 Rewind (REW) mode

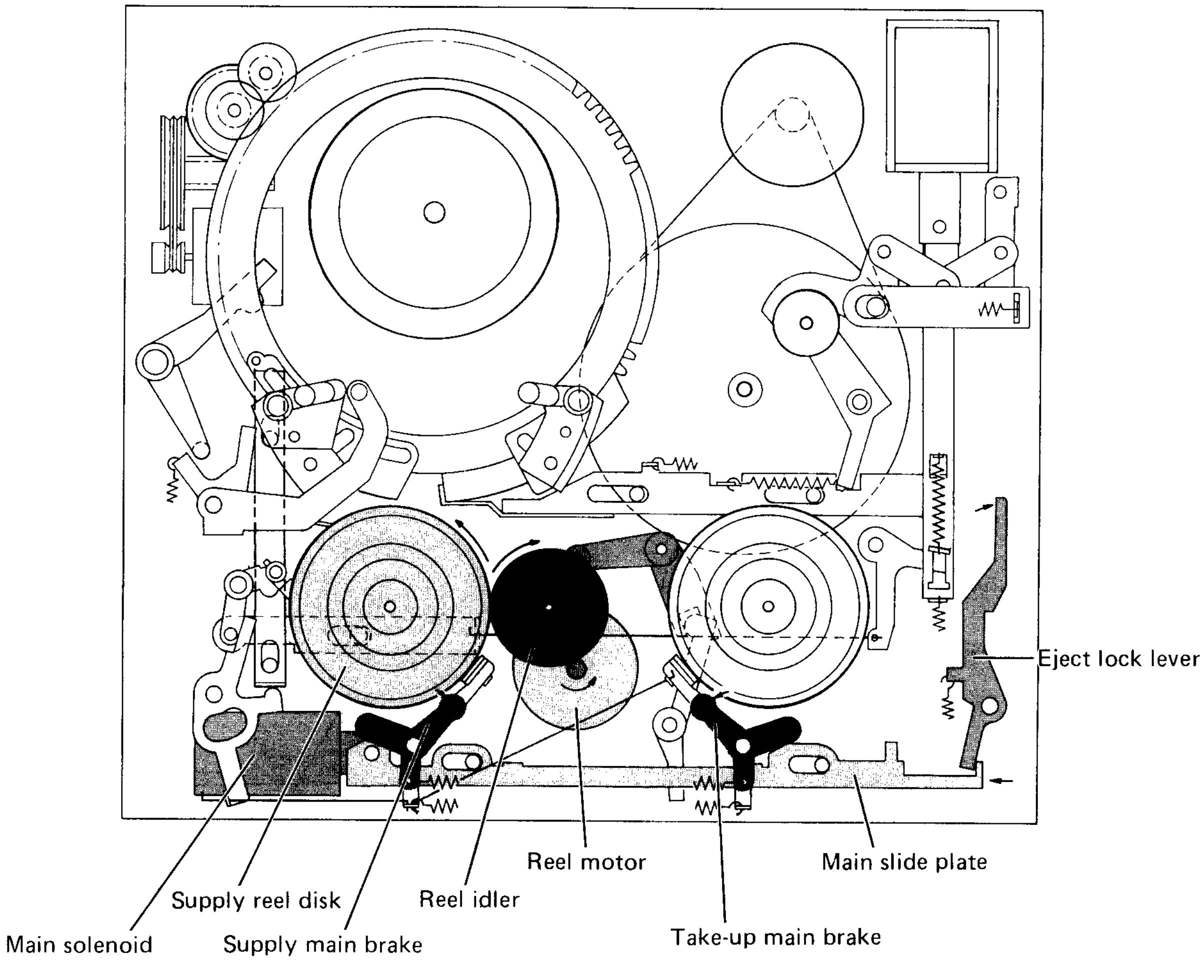

Eject lock lever
Reel motor
Main slide plate
Supply reel disk
Reel idler
Main solenoid
Supply main brake
Take-up main brake

Fig. 2-17 REW mode

This is the same as the FF mode, except that the reel motor rotates counter-clockwise, and the reel idler is applied to the supply reel disk.

SECTION 3
CIRCUIT DESCRIPTION

3.1 GENERAL

The electronic circuits of this model are distributed among seven major circuits boards: preamplifier and recording amplifier (PRE/REC), luminance (Y), chrominance (CHROMA), audio and CPU, mechanism control (MECHACON), servo, and motor drive amplifier (MDA). In addition, the EG type includes a SECAM detector (S. DET) board. High compactness and reliability are achieved by the use of numerous integrated circuit (IC) devices.

3.2 VIDEO SYSTEM

3.2.1 Outline

Video signals are recorded and played back by using special rotary video heads. In the recording process, a bandpass filter (BPF) separates the chrominance (chroma) signal from the luminance (Y) signal. The luminance component is then frequency modulated, while the chroma component is converted to a low frequency centered on 627 kHz. Afterwards, the two signals are mixed and recorded on the tape.

During playback, filter networks again separate the luminance and chroma components. The FM luminance signal is demodulated and the chroma signal is returned to its normal spectral position. After going through automatic correction circuits, the signals are recombined in a form which can be viewed on a TV-monitor.

3.2.2 Luminance signal recording system

Signal inputs for recording consist of line, tuner and camera. If a video camera is connected, the camera signal has priority over the other inputs. The camera select circuit is composed of X1 to X3, D1, D2 and IC1 electronic switch.

The signal to be recorded is branched in two directions: one to the chroma processing circuit and the other to the AGC (automatic gain control) circuit at IC2 pin 12. This circuit functions to maintain a fixed signal level. Through X6 and lowpass filter LPF-1, the resulting luminance signal goes to the pre-processing circuit (pre-emphasis, clamping, white clip, etc.) of IC2.

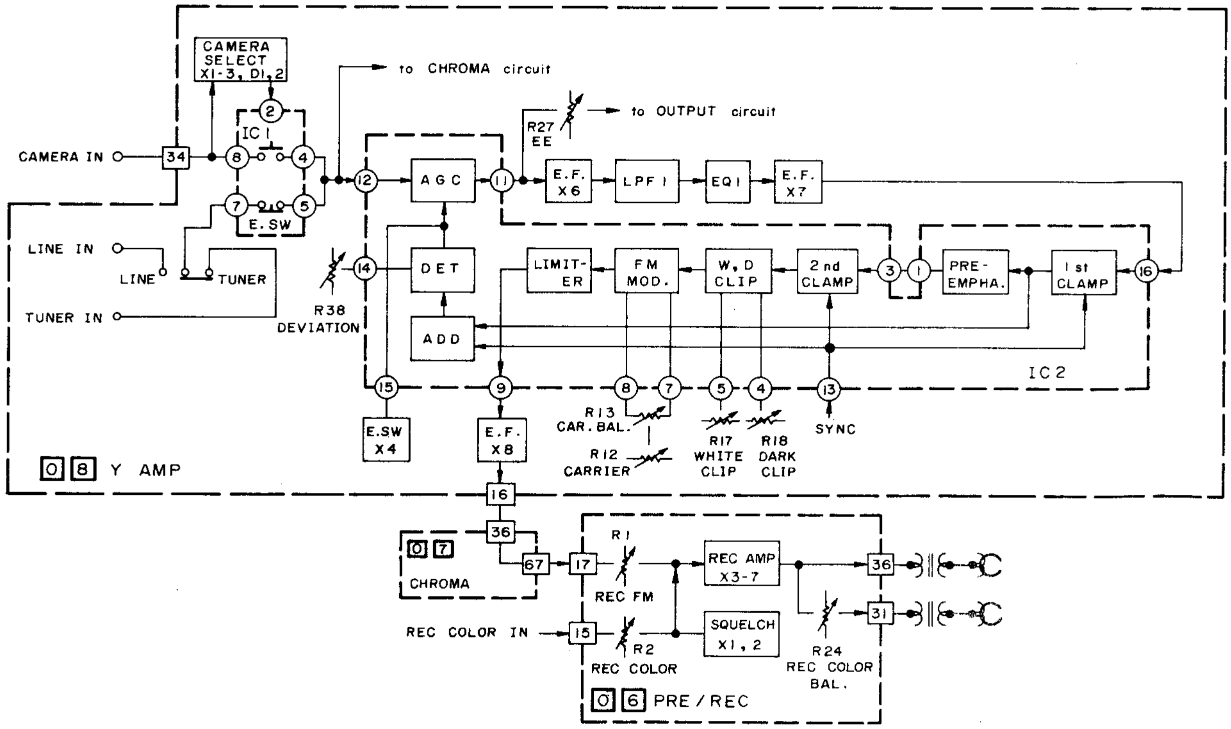

CAMERA SELECT X1-3, D1,2
to CHROMA circuit
to OUTPUT circuit
R27 EE
CAMERA IN
34
IC 1
2
8
4
7
5
E.SW
LINE IN
LINE
TUNER
TUNER IN
R38 DEVIATION
12
AGC
11
E.F. X6
LPF 1
EQ 1
E.F. X7
14
DET
ADD
LIMITER
FM MOD.
W, D CLIP
2nd CLAMP
3
1
PRE-EMPHA.
1st CLAMP
16
IC 2
15
9
8
7
5
4
13
E.SW X4
E.F. X8
R13 CAR. BAL.
R12 CARRIER
R17 WHITE CLIP
R18 DARK CLIP
SYNC
08 Y AMP
16
36
07 CHROMA
67
17
R1
REC FM
REC AMP X3-7
36
31
SQUELCH X1, 2
REC COLOR IN
15
R2 REC COLOR
R24 REC COLOR BAL.
06 PRE / REC

Fig. 3-1 Luminance signal recording system

Since pre-emphasis can cause overshoot in the areas of rapid signal level changes, the white and dark clip circuits are used to prevent over-modulation. The luminance signal is then frequency modulated and sent via emitter-follower X8 and the CHROMA board to the PRE/REC board.

At the PRE/REC board, the FM luminance signal is mixed with the converted chroma signal and applied to the video heads through recording amplifier X3 to X7.

3.2.3 Chroma signal recording system

Bandpass filter BPF-1 separates the chroma component from the video signal obtained from the Y amplifier. The ACC (automatic color control) circuit of IC2 stabilizes the chroma signal level. At the main converter, the 4.43 MHz subcarrier is converted by mixing with a 5.06 MHz signal supplied from the sub-converter. The outputs of the main converter become the sum and difference frequencies of both input signals. Lowpass filter LPF-3 passes only the difference frequency (627 kHz). The signal is then mixed with the luminance signal at the PRE/REC board and supplied to the video heads for recording.

3.2.4 Playback signal flow

Due to the slant azimuth recording system, each of the video heads produces an effective signal only when it traces its corresponding recorded tape track. Thus, as the head drum rotates, signals are obtained alternately from the heads. At the PRE/REC board, preamplifiers

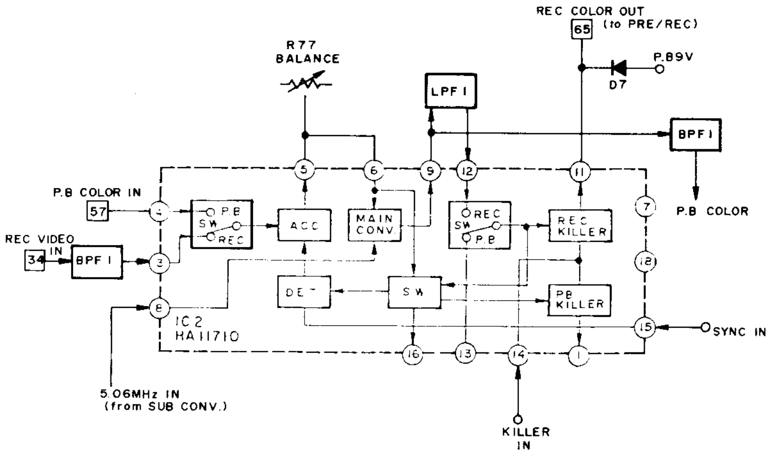

REC COLOR OUT
65
(to PRE/REC)
R77
BALANCE
P.B9V
D7
LPF I
BPF I
P.B COLOR IN
57
REC VIDEO IN
34
BPF I
SW
P.B
REC
ACC
MAIN CONV.
SW
REC
P.B
REC KILLER
P.B COLOR
DET
SW
PB KILLER
IC 2
HA11710
SYNC IN
5.06MHz IN
(from SUB CONV.)
KILLER IN
5
6
9
12
11
4
3
8
7
12
15
16
13
14
1

Fig. 3-2 Chroma signal recording system

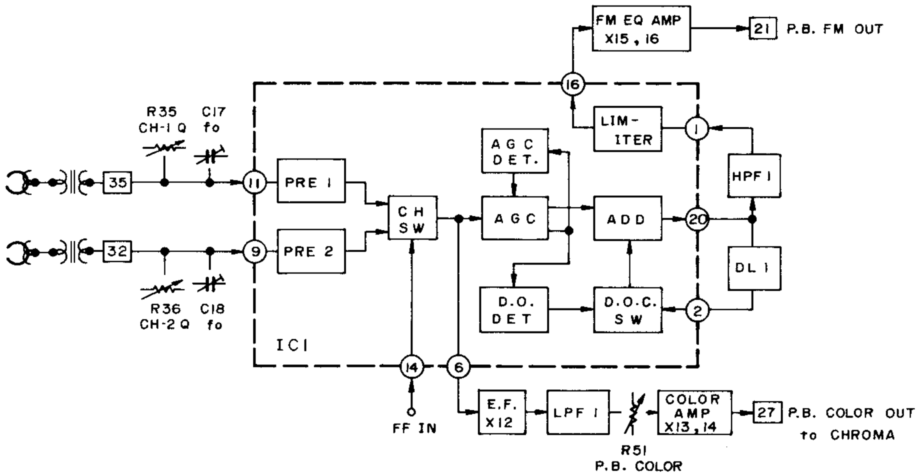

FM EQ AMP
X15, 16
21
P.B. FM OUT
R35
CH-1 Q
C17
fo
35
32
R36
CH-2 Q
C18
fo
PRE 1
PRE 2
CH SW
AGC DET.
AGC
D.O. DET
LIM-ITER
ADD
D.O.C. SW
HPF 1
DL 1
IC1
FF IN
E.F. X12
LPF 1
COLOR AMP X13, 14
27
P.B. COLOR OUT
to CHROMA
R51
P.B. COLOR
16
11
9
1
20
2
14
6

Fig. 3-3 Luminance and chroma signal playback system

PRE-1 and PRE-2 of IC1 amplify the FM signals, after which they are combined into a single continuous signal by switching in reference to a symmetrical squarewave (FF IN).

The recombined FM signal is branched in two directions. One of these goes to the FM AGC circuit, where a drop-out compensator (DOC) consisting of detector, switch and delay line DL-1 corrects for tape dropouts (transient loss of signal due to imperfections in the tape itself). The output of an adder circuit is applied to HPF-1 which eliminates the chroma signal. Via the FM equalizer, the resulting signal is sent to the luminance demodulator circuit of the Y board.

The other output of the FM channel switcher (CH SW in block diagram) goes via emitter-follower X12 to LPF-1. From the lowpass filter, the resulting 627 kHz chroma signal goes to color amplifier X13 and X14, then to the CHROMA board.

3.2.5 Luminance signal output

The playback FM signal from the PRE/REC board is routed via the CHROMA board to demodulator IC3 of the Y board. From the delay type demodulator, the demodulated signal goes through LPF-2 and EQ-2 to equalizing amplifier X9 and X10, where frequency response correction and de-emphasis are performed. In order to improve overall signal to noise ratio, the output is sent to the noise clip circuit of IC3, after which it is mixed with the playback chroma signal from the CHROMA board. The resulting signal then goes through a switching circuit to the output.

In the E-E (electric to electric) mode, the video signal from the AGC circuit is selected by a switching circuit and applied to the video amplifier of IC3. The vertical pulse mixing circuit of X13 is bypassed during E-E and normal playback modes. During shuttle search, slow, still and frame advance modes, the vertical pulse (50 Hz) is mixed with the video signal. Adding this pulse improves picture stability in these modes by compensating for noise interference with the vertical sync component of the playback picture.

One output of clamp circuit D4 and X14 goes via electronic switch X16 and emitter-follower X17 to the camera connector as the playback monitoring signal. In the E-E mode, this output is cut off by X16.

The other output is sent to emitter-follower X15, then to the VIDEO OUT connector as the video output signal. X15 also supplies the signal to the RF converter via EQ-3 and output amplifier X18 and X19.

3.2.6 Chroma signal playback

The playback color signal from the PRE/REC board is supplied to the ACC of IC2, which maintains the signal

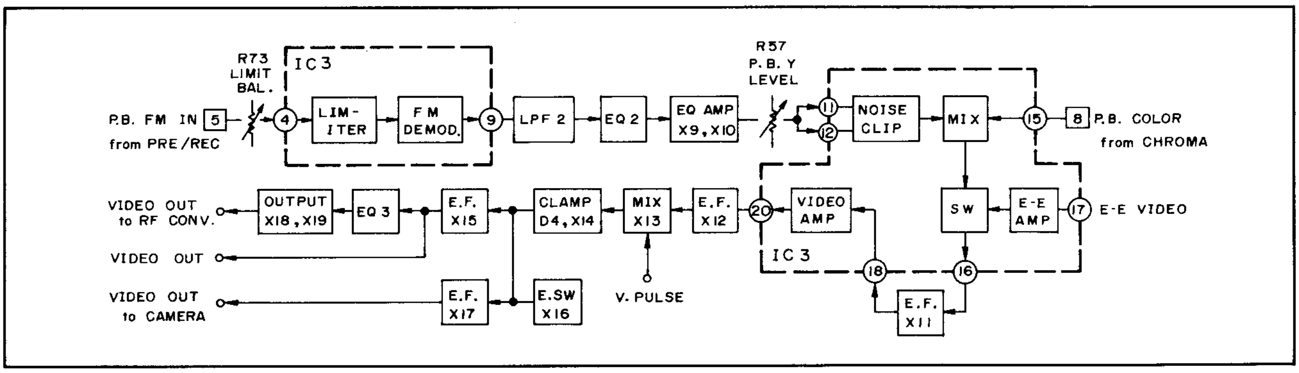

R73
LIMIT BAL.
IC3
P.B. FM IN
5
from PRE/REC
4
LIM-ITER
FM DEMOD.
9
LPF 2
EQ 2
EQ AMP X9,X10
R57
P.B. Y LEVEL
11
12
NOISE CLIP
MIX
15
8
P.B. COLOR from CHROMA
VIDEO OUT to RF CONV.
OUTPUT X18,X19
EQ 3
E.F. X15
CLAMP D4,X14
MIX X13
E.F. X12
20
VIDEO AMP
SW
E-E AMP
17
E-E VIDEO
VIDEO OUT
IC3
18
16
VIDEO OUT to CAMERA
E.F. X17
E.SW X16
V. PULSE
E.F. X11

Fig. 3-4 Luminance signal output and video output system

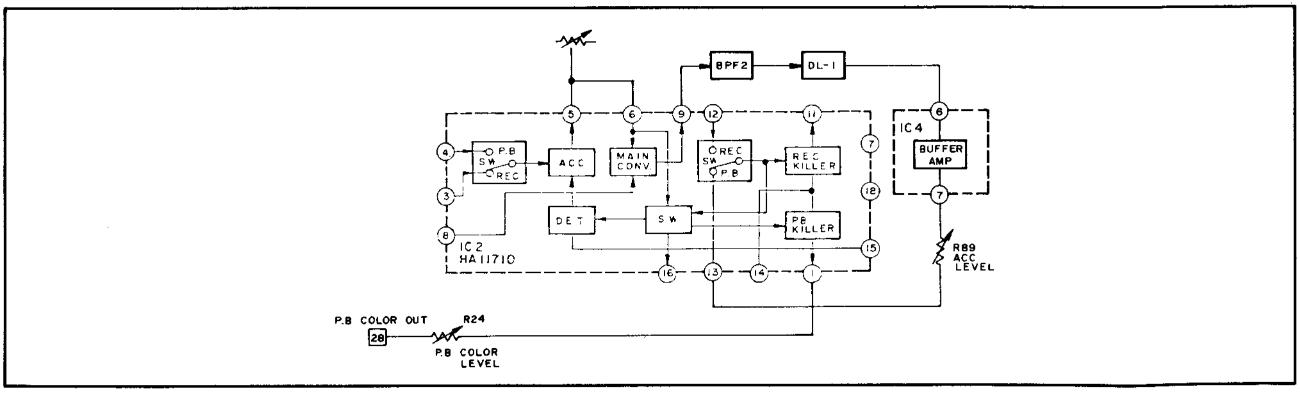

BPF2
DL-1
5
6
9
12
11
6
IC4
4
P.B SW REC
ACC
MAIN CONV
REC SW P.B
REC KILLER
7
BUFFER AMP
3
DET
SW
18
7
8
PB KILLER
IC2 HA11710
15
R89 ACC LEVEL
16
13
14
1
P.B COLOR OUT
28
R24
P.B COLOR LEVEL

Fig. 3-5 Chroma playback

at a constant level. At the main converter, 5.06 MHz obtained from sub converter IC3 is mixed with the chroma signal. Through BPF-2, the resulting 4.43 MHz chroma signal goes to delay line filter DL-1, which removes crosstalk and improves S/N.

Delay line DL-1 output first goes from IC4 buffer amplifier to IC2. From this point, it is branched in two lines, one of which re-enters IC4 and goes to the killer and phase detector circuits. The other output is routed via the playback killer circuit to the Y board, where it is mixed with the luminance signal to become the video output.

3.2.7 Automatic phase control (APC)

In the recording mode, the APC circuit does not operate and the VCO (voltage controlled oscillator) functions as a fixed oscillator to supply 4.43 MHz to IC3 sub-converter. At the same time, 627 kHz from the AFC loop is also applied to the sub-converter, yielding sum and difference frequencies which go to BPF-3. The band-pass filter passes only the 5.06 MHz sum component for use by the main converter.

Various mechanical and physical factors are encountered during playback. Differences in ambient temperature, tape to head contact, minute variations in head rotation, elasticity of the tape and other phenomena contribute to a frequency error (±Δf) with respect to the recorded signal. The APC and AFC loops therefore function to compensate for this error and provide an acceptable playback picture.

In the playback mode, the 627 kHz ±Δf from the ACC circuit is applied to the main converter. At the same time, 4.43 MHz from the VCO and 627 kHz from the AFC loop go to the sub-converter. The sum of these frequencies (5.06 MHz) is also sent to the main converter.

The 4.43 MHz ±Δf (difference frequency) component obtained from the main converter and BPF-2 is supplied to the phase detector and killer detector of IC4. Another 4.43 MHz signal from the crystal oscillator of IC3 is also applied to the phase detector via carrier amplifier-2. The phase detector compares the phases of these signals and produces an error voltage which goes to the VCO.

Consequently, by varying the VCO output frequency in accordance with ±Δf, a stable 4.43 MHz output can be obtained from BPF-2.

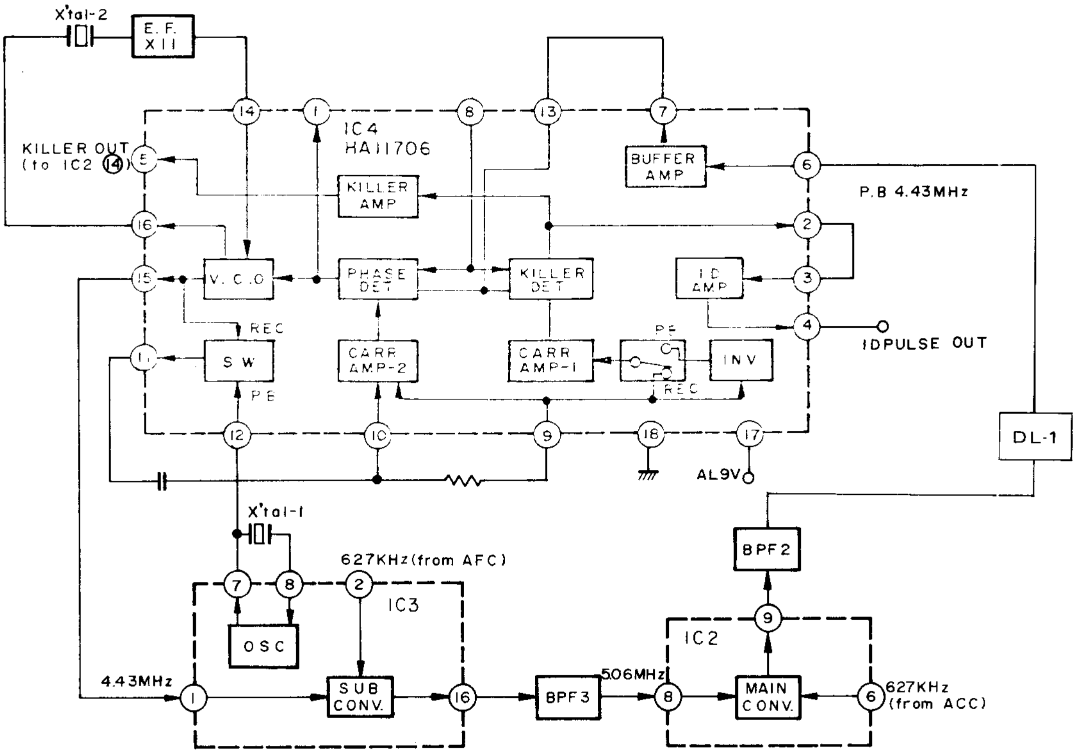

X'tal-2
E. F. X11
14
1
8
13
7
IC4
HA11706
KILLER OUT
(to IC2 ⑭)
5
BUFFER AMP
6
P.B 4.43MHz
KILLER AMP
16
2
15
V. C. O
PHASE DET
KILLER DET
ID AMP
3
REC
PE
4
IDPULSE OUT
11
SW
CARR AMP-2
CARR AMP-1
INV
PE
REC
12
10
9
18
17
AL9V
DL-1
X'tal-1
627KHz(from AFC)
BPF2
7
8
2
IC3
9
OSC
IC2
4.43MHz
1
SUB CONV.
16
BPF3
5.06MHz
8
MAIN CONV.
6
627KHz (from ACC)

Fig. 3-6 Automatic phase control (APC) system

3.2.8 Automatic frequency control (AFC)

The AFC loop functions in the same manner during both recording and playback. In the recording mode, the reference signal is the horizontal sync pulse of the input video signal, while the H. pulse component of the playback video signal is used in the playback mode.

A 40 fH color signal (40 x 15.625 kHz = approx. *625 kHz) is produced in this circuit.

Other functions of the AFC loop are phase control of the color signal ID pulse and compensation with respect to the input horizontal sync pulse.

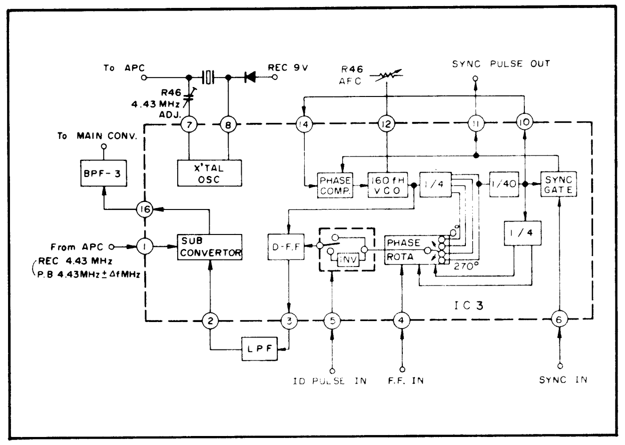

To APC
REC 9V
R46 AFC
SYNC PULSE OUT
R46 4.43 MHz ADJ.
To MAIN CONV.
BPF-3
X'TAL OSC
PHASE COMP.
160 fH VCO
1/4
1/40
SYNC GATE
From APC
REC 4.43 MHz
P.B 4.43MHz ± ΔfMHz
SUB CONVERTOR
D-F.F
INV
PHASE ROTA
270°
1/4
IC3
LPF
ID PULSE IN
F.F. IN
SYNC IN

Fig. 3-7 Automatic frequency control (AFC) system

*In practice, 627 kHz is used in order to minimize externally introduced interference.

3.3 AUDIO SYSTEM

3.3.1 Outline

Four audio signal inputs are provided: microphone (MIC), camera, line (audio) and tuner. The MIC input has priority, then the CAMERA input. When a video camera is connected, electronic switch X6 functions from the camera mode signal sent from the Y board, cutting off line and tuner signals.

3.3.2 Audio recording

The signal from the MIC jack is supplied to the AGC circuit. This circuit includes an electronic switch which shorts the input line during the playback mode. Control of the AGC circuit is performed by voltage rectified (D5 and D6) from the line output amplifier of IC2. The output of the AGC circuit goes to the amplifier of IC1.

One output of the IC1 amplifier is sent to the recording amplifier of IC2 via an electronic switch and R43 (REC LEVEL). This signal is mixed with AC bias and applied to the audio REC/PB head. Recording bias is an approx. 70 kHz signal from L4 through R81 (AC BIAS). Transistors X12 and X13 comprise the push-pull type bias oscillator, which is controlled by X14, D12, D13 and D14. The L4 output is applied to the full erase, audio erase and audio heads. Audio head switching is performed by electronic switches X1, X2, X3 and X5.

The other IC1 amplifier output goes to the IC2 output amplifier. From this point, the signal is sent to the AGC detector and audio output connectors: AUDIO OUT, EARPHONE OUT, CAMERA CONNECTOR and RF OUT through the RF converter.

3.3.3 Audio playback

Via an electronic switch, the playback signal goes to the preamplifier of IC1. After further amplification in IC1, the signal is sent to the output amplifier. Following operations are the same as for the recording mode.

A muting circuit composed of X11, X31 and D4 mutes the output signal during the still, frame advance, slow and shuttle search modes.

3.3.4 Audio dubbing

Audio dubbing is performed with the video signal in the playback mode and the audio circuit in the recording mode. At this time, X15 and relay RL1 cut off the L4 erase signal from the full erase head.

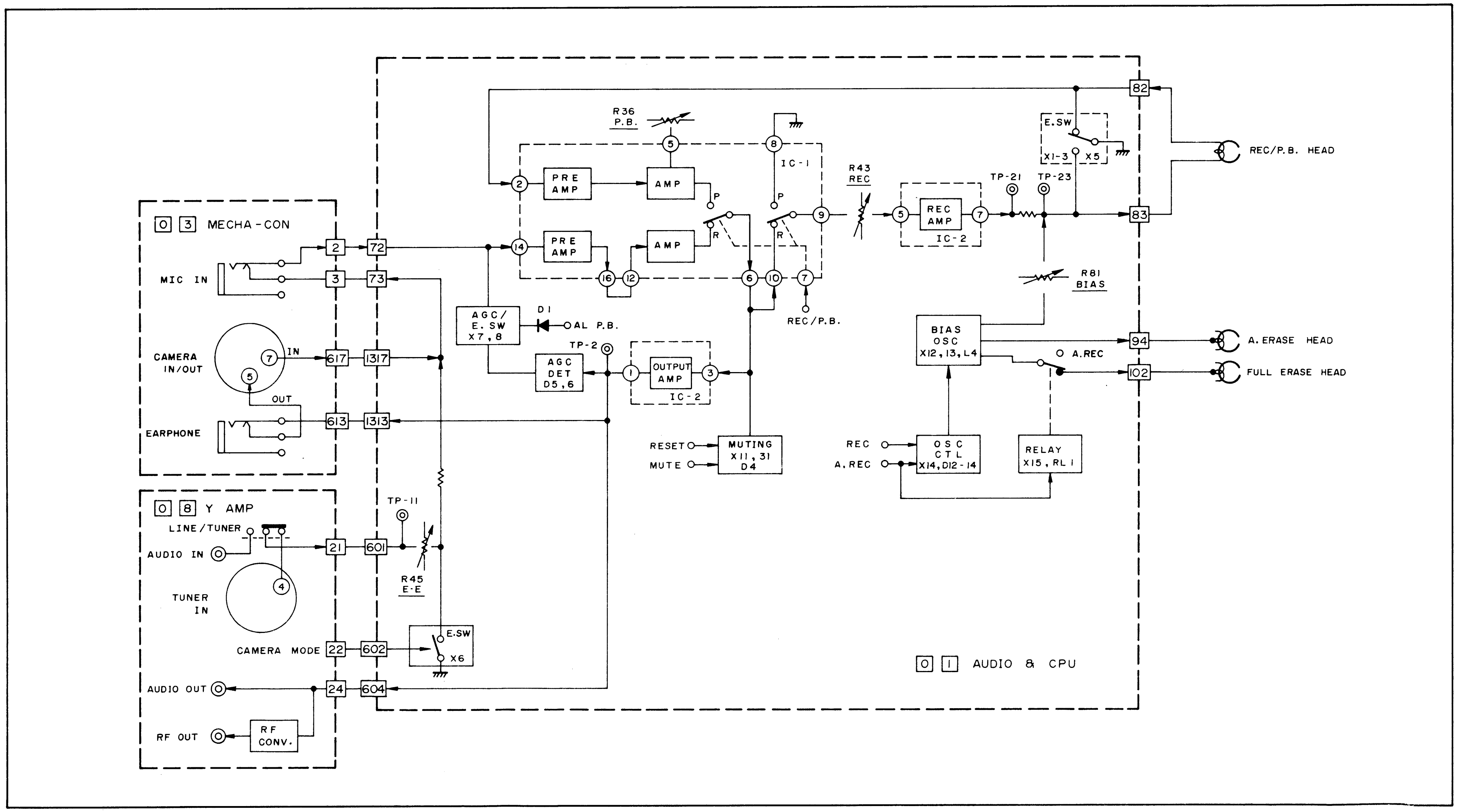

0 3 MECHA-CON
MIC IN
CAMERA IN/OUT
IN
OUT
EARPHONE
0 8 Y AMP
LINE/TUNER
AUDIO IN
TUNER IN
CAMERA MODE
AUDIO OUT
RF OUT
RF CONV.
2
3
617
613
21
22
24
72
73
1317
1313
601
602
604
TP-11
R45 E-E
E.SW X6
AGC/ E.SW X7, 8
D1
AL P.B.
TP-2
AGC DET D5, 6
R36 P.B.
PRE AMP
AMP
IC-1
OUTPUT AMP
IC-2
R43 REC
REC AMP
IC-2
REC/P.B.
TP-21
TP-23
E.SW
X1-3
X5
R81 BIAS
BIAS OSC X12, 13, L4
A.REC
RESET
MUTE
MUTING X11, 31 D4
REC
A.REC
OSC CTL X14, D12-14
RELAY X15, RL1
82
83
94
102
REC/P.B. HEAD
A. ERASE HEAD
FULL ERASE HEAD
0 1 AUDIO & CPU

Fig. 3-8 Audio system

3.4 MECHANISM CONTROL (MECHACON) CIRCUIT

3.4.1 Outline

The mechanism control circuit is distributed mainly among the MECHACON, AUDIO & CPU and SERVO boards. It functions to correlate the electrical and mechanical operations of the machine, set up the selected operating modes, and interlock the systems in such a manner that damage to the machine and tape is prevented in event of user error. The main functional component of the mechancon circuit of this model is a one-chip 4-bit microcomputer.

3.4.2 Switch locations

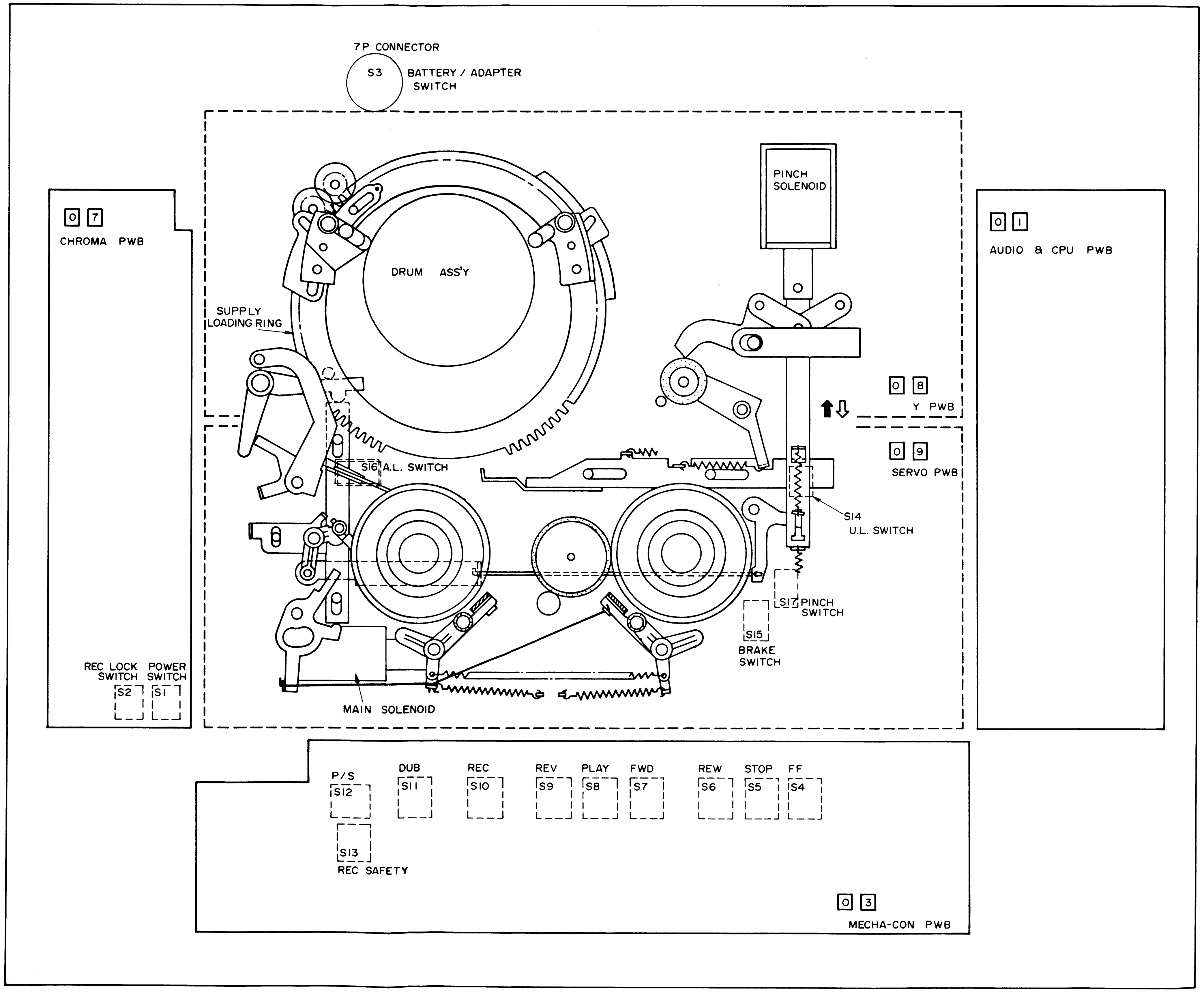

7P CONNECTOR
S3
BATTERY / ADAPTER SWITCH
PINCH SOLENOID
07
CHROMA PWB
DRUM ASS'Y
01
AUDIO & CPU PWB
SUPPLY LOADING RING
08
Y PWB
09
SERVO PWB
S16 A.L. SWITCH
S14
U.L. SWITCH
S17 PINCH SWITCH
S15
BRAKE SWITCH
REC LOCK SWITCH
POWER SWITCH
S2
S1
MAIN SOLENOID
P/S
S12
DUB
S11
REC
S10
REV
S9
PLAY
S8
FWD
S7
REW
S6
STOP
S5
FF
S4
S13
REC SAFETY
03
MECHA-CON PWB

Fig. 3-9 Switch functions

Switch		Timing of operation	Function
No.	Name		
S1	Power	POWER button pressed	Switch for power supply to unit
S2	REC lock	REC LOCK button pressed	Switch for automatic recording
S3	AC/Battery	Tuner/adapter connector (7 pin) inserted	Selects internal battery and external power supply (tuner or adapter).
S4	FF	FF button pressed	Selects indicated mode.
S5	Stop	STOP button pressed	"
S6	Rew.	REW button pressed	"
S7	Forward	S-FWD button held depressed	"
S8	Play	PLAY button pressed	"
S9	Reverse	S-REV button held pressed	"
S10	Rec.	PLAY and REC buttons pressed	"
S11	A. dub.	PLAY and AUDIO DUB buttons pressed	"
S12	Pause/Still	PAUSE/STILL button pressed	"
S13	Rec. safety	Cassette presses rec. safety pawl.	Detects cassette rec. safety tab.
S14	U.L.	Switched on by slide lever when T.U. loading ring returns in unloading.	Detects presence of tape in the cassette.
S15	Brake	ON when main solenoid operates.	Detects status of main solenoid.
S16	A.L.	ON by A.L. plate when T.U. loading ring moves cancel lever after loading.	Detects loading mode complete.
S17	Pinch	ON when pinch roller solenoid operates.	Detects status of pinch roller solenoid.

Table 3-1 Switch functions

3.4.3 Circuit operations

1. Power on state
   1) STOP LED lights.
   2) The Stop mode is produced.
   3) If tape is loaded, unloading is performed, then the Stop mode produced.

2. Mode priorities
   1) Button operations are shown in the Mode shift table (Table 3-2). Generally, a desired mode can be selected directly from a mode in progress.
   2) If two or more buttons are pressed simultaneously, the following priority applies: STOP – REC – DUB – PLAY – FF – REW – PAUSE/STILL.
   3) Shuttle search forward and reverse are enabled only during the Play, Still and Slow modes. These are performed while the S-FWD or S-REV button is held depressed.
   4) Simultaneously pressing the S-FWD and S-REV buttons yields the Play mode.
   5) The following combined button operations are enabled: REC + PLAY; REC + PAUSE/STILL; AUDIO DUB + PLAY; AUDIO DUB + PAUSE/STILL.

Button operation / Current mode	STOP	PLAY	F.F.	REW	PLAY +REC	PLAY +DUB	P/S +REC	P/S +DUB	FWD	REV	PAUSE /STILL	SLOW	FRAME ADV
STOP		O	O	O	O	O	O	O	X	X	X	X	X
PLAY	O		O	O	O	O	O	O	O	O	O STILL	O	X
F.F.	O	O		O	O	O	O	O	X	X	X	X	X
REW	O	O	O		O	O	O	O	X	X	X	X	X
REC	O	X	X	X		X	O	X	X	X	O REC PAUSE	X	X
DUB	O	X	X	X	O		O	O	X	X	O DUB PAUSE	X	X
REC PAUSE	O	O REC	X	X	O	X		O	X	X		X	X
DUB PAUSE	O	O DUB	X	X	O	O	O		X	X		X	X
FWD	O	O	O	O	O	O	O	O		X	O STILL latch	O SLOW latch	X
REV	O	O	O	O	O	O	O	O	O		O STILL latch	O SLOW latch	X
STILL	O	O	O	O	O	O	O	O	O	O		O	O
SLOW	O	O	O	O	O	O	O	O	O	O	O		X

O : Enabled X : Inhibited (Current mode maintained)

Table 3-2 Mode shift table

3. Stop mode entry

1) The Stop mode is entered automatically at tape end and tape start.

2) When the power supply voltage declines to 10.8 V, the BATT indicator lights. At 10.5 V, the Stop mode is automatically entered.

3) In event of moisture condensation, the DEW indicator lights and the Stop mode is entered. In this and the above cases, button operations are inhibited until normal conditions return.

4) During the COUNTER MEMORY mode, when the indication reaches 0 in FF and REW.

5) In the FF or REW mode, when the take-up reel stops for more than 4 to 6 seconds, the Stop mode is obtained (due to stop output from counter).

4. Alarm mode

In the following situations, the Stop mode is automatically set and the mode indicators flash sequentially from left to right. After correcting the difficulty, briefly set the power to off, then to on in order to enable mode operations.

1) If the brake and pinch switches are not operated on/off within approx. 2.5 seconds after the brake (main) and pinch solenoid commands are sent from the CPU.

2) Drum rotation stopped; absence of the drum flip-flop signal for 4 to 6 seconds in a mode when the head drum is supposed to rotate.

3) Take-up reel stops for 2 to 4 seconds in the Play, Recording or Audio Dub mode.

4) Cassette lamp failure.

5) Loading or unloading mode does not complete within about 6 seconds after starting.

5. Recording (REC) lock switch

1) After power on, if the REC lock switch is pressed within about 2 seconds, the Recording mode is obtained.

2) If another operating button is pressed during this 2 seconds, REC lock is disregarded and the selected mode becomes entered.

3) REC lock operating is enabled in both loading and unloading modes.

4) REC lock is inhibited at tape end.

5) In REC LOCK recording, the REC PAUSE mode is held for about 3 seconds after completion of loading (although REC and PLAY indicators light) in order to obtain stable servo operation. Afterwards, the Recording mode is entered.

6) In the same manner as for normal Recording mode, other button operations are enabled during the REC LOCK mode.

6. Camera operations (camera connected)

1) During camera stop, REC operation from the mainframe is inhibited. At other times, it is enabled.

2) In the camera start mode, REC PAUSE can be set from the mainframe. At this time, recording can be resumed from the camera by briefly setting to camera stop, then to camera start.

7. Other operations

1) If Still, Slow, REC Pause or Dub Pause are set at the transparent leader portion of the tape, the Play/REC mode is initially performed, then the selected mode becomes entered.

2) Continuous duration of the Still, Slow, REC Pause and Dub Pause modes is limited to approximately 5 minutes, after which the Stop mode is automatically entered.

3) When Still or Slow is set during the loading process, the Play mode is performed for about one second after completion of loading, then the selected mode is entered.

4) At tape end, Play, REC, Dub and FF are inhibited.

5) At tape start, REW and S-REV are inhibited.

6) During the transition from Shuttle Search to Slow or Still, the Play mode is performed for about one second, then the selected mode is entered.

7) When REC LOCK is set at the starting portion of the tape, after passage of the tape leader, the REC Pause mode is set for about 3 seconds, then the Recording mode is entered.

8) Both REC and Dub modes are inhibited in absence of the REC safety tab (REC safety switch open).

9) In absence of the REC safety tab, simultaneously pressing the REC + PLAY or AUDIO DUB + PLAY buttons yields the Play mode.

10) Pinch roller operation is synchronized to the drum flipflop pulse in the REC, REC Pause, Dub and Dub pause modes.

11) Frame advance is enabled only in the Still mode. One TV picture frame is advanced every time the FR ADV button is pressed. When the button is held depressed, advance becomes continuous at the rate of one frame per second.

3.4.4 Microcomputer μPD553C-066

The mechacon circuit of this model includes a 1-chip 4-bit microcomputer (located on the audio & CPU board). Its main functions include:

1) Control power supply to the various circuits according to mode.

2) Sequential operation of motors and solenoids for mechanism control according to selected mode.

3) Protective operations in event of moisture condensation on the head drum, take-up system malfunction and other abnormal occurrences.

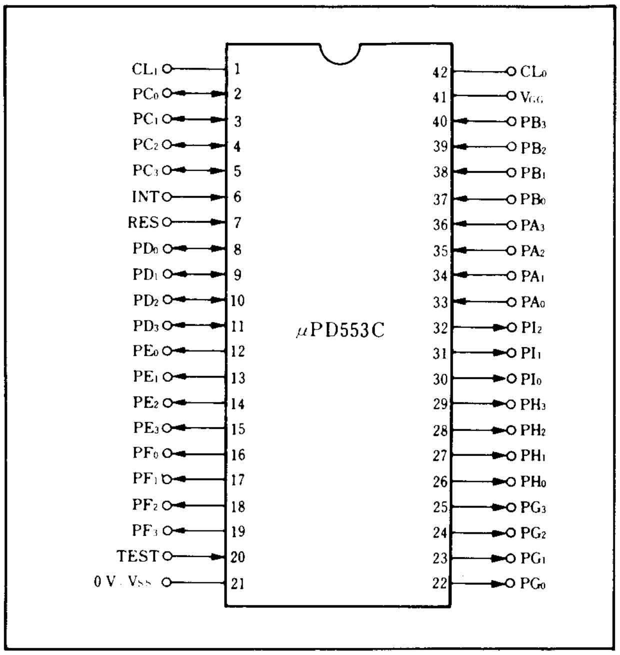


Fig. 3-10 μPD553C

Terminals	Input/Output	Functions
$\overline{\text{INT}}$	Input	Interrupt call input.
RES	Input	Reset input.
PA$_{3\sim0}$	Inputs	Input ports A$_{3\sim0}$. 4 bit input and bit test.
PB$_{3\sim0}$	Inputs	Input ports B$_{3\sim0}$. 4 bit input and bit test.
PC$_{3\sim0}$	Input/output	Input/output ports C$_{3\sim0}$ During input: 4 bit input and bit test. During output: 4 bit output and immediate data output.
PD$_{3\sim0}$	Input/output	Input/output ports D$_{3\sim0}$. During input: 4 bit input and bit test. During output: 4 bit output and immediate data output.
PE$_{3\sim0}$	Outputs	Output ports E$_{3\sim0}$. 4 bit output, and bit set and reset.
PF$_{3\sim0}$	Outputs	Output ports F$_{3\sim0}$. 4 bit output, and bit set and reset.
PG$_{3\sim0}$	Outputs	Output ports G$_{3\sim0}$. 4 bit output, and bit set and reset.

$PH_{3\sim0}$	Outputs	Output ports $H_{3\sim0}$. 4 bit output, and bit set and reset.
$PI_{2\sim0}$	Outputs	Output ports $I_{2\sim0}$. 3 bit output, and bit set and reset.
$CL_{1\sim0}$	–	For connecting an external LC resonance circuit (IFT, etc.) for the internal clock oscillator.
TEST	Input	LSI test input. Normally connect to Vss (0 V).

1 machine cycle = 4 clock cycles
1 instruction cycle = 1 to 4 machine cycles
Clock osc. = 400 kHz

1. Input ports

1) Input ports A are fanned out by data selectors IC1 (A_0) and IC2 (A_1) of the mechanism control board. Table 3-3 shows the inputs of these ICs. The brake and pinch switches are connected to ports A_2 and A_3.

2) Port B connections are indicated in Table 3-4.

2. Output ports

1) The outputs of ports C, D and F correspond to the operations of mechacon timing charts a and b, in Fig. 3-11.

2) E, G and H are power supply mode outputs according to operating mode.

3) The outputs of ports I select the sensor data inputs to the CPU according to the program contents.

a b c		A_0	A_1	A_2	A_3
0 0 0	D_0	A.L. SW (L)	U.L. SW (L)	Brake SW (L)	Pinch SW (L)
1 0 0	D_1	*Counter output (L)	*Repeat SW (L)		
0 1 0	D_2	Pinch sol. on (L)	Pinch sol. off (H)		
1 1 1	D_3	End sensor (H)	Start sensor (H)		
0 0 1	D_4	Camera pause (H)	Timer, Rec. lock SW (L)		
1 0 1	D_5	Drum rotation detector (H)	Cass. lamp open (H)		
0 1 1	D_6	REC safety (H)	*Cassette SW (L)		
1 1 1	D_7	Batt. down detector & Dew sensor (H)	Take-up abnormal (H)		

(H) : HIGH active
(L) : LOW active

*The counter output repeat SW and cassette SW are not used in this model. These are fixed at H, H and L, respectively.

Table 3-3 Ports A

a b c	B_0	B_1	B_2	B_3
0 1 1	PLAY	REC	PAUSE/STILL	DUB
1 0 1	STOP	FF	REW	FLIP-FLOP
1 1 0	FWD	REV	SLOW	FRAME ADV.

Table 3-4 Ports B

	C	D	E	F	G	H	I
0	Drum motor CTL (L)	Reel motor CTL	REC, FF REW, STOP	Brake (main) sol. (+)	Audio muting	LED DATA	a
1	Capstan motor CTL (L)	Reel motor CTL	REC, DUB, FF REW, STOP	Brake (main) sol. (−)	SLOW	LED CK	b
2	Loading motor (+)	Reel motor CTL	Counter down (L)	Pinch sol. (+)	FRAME ADV.	Power DATA	c
3	Loading motor (−)	Reel motor CTL	Counter operate (L)	Pinch sol. (−)	Cassette lamp	Power CK	

Table 3-5 Ports C, D, E, F, G, H and I

	$D_0D_1D_2D_3$	OUTPUT
0	0 0 0 0	OFF
1	0 0 0 1	REW ⑤
2	0 0 1 0	FF ⑤
3	0 0 1 1	
4	0 1 0 0	PLAY ②
5	0 1 0 1	
6	0 1 1 0	Idler shift ①
7	0 1 1 1	UNLOADING ③
8	1 0 0 0	FWD ④
9	1 0 0 1	REV ④

Decoded by servo circuit

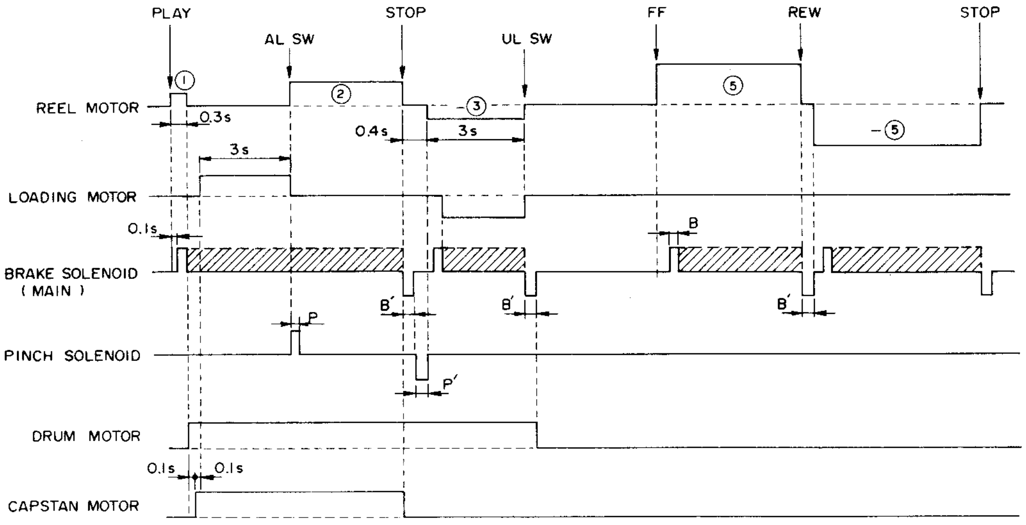
Circled numbers refer to Fig. 3-11,

Table 3-6 Ports D (Reel motor control)

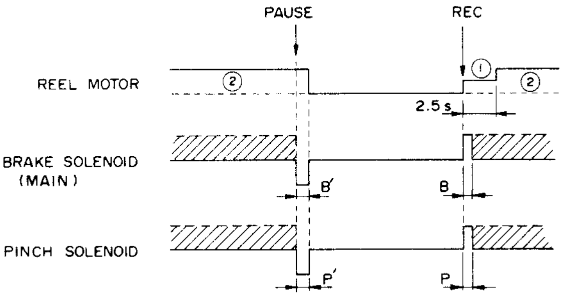
	LED	POWER SUPPLY
1	PAUSE/STILL	AL-PAUSE/STILL
2	DUB (A)	
3	REC (P) (S)	$\text{* AL}\begin{cases}\text{REC PLAY}\\ \text{DUB PLAY}\end{cases}$
4	PLAY	* AL-REC
5	REW	* AL-DUB PLAY
6	STOP	$\text{AL}\begin{cases}\text{PLAY}\\ \text{STILL (A)}\\ \text{SLOW}\end{cases}$
7	FF	AL-STILL (S)
8		AL-VP (Y)

- Fan out by shift register.
- *Power supplies 3, 4 and 5 are not used.

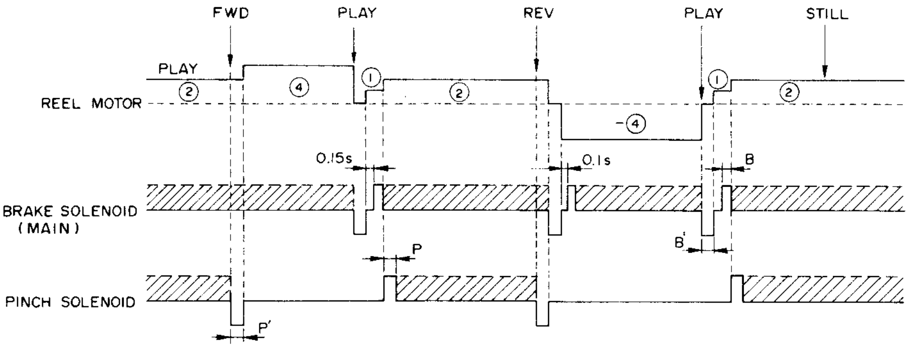
Table 3-7 Ports H


PLAY
STOP
FF
REW
STOP
AL SW
UL SW
REEL MOTOR
①
②
-③
⑤
-⑤
0.3s
3s
0.4s
3s
LOADING MOTOR
0.1s
B
BRAKE SOLENOID
(MAIN)
B'
B'
B'
P
PINCH SOLENOID
P'
DRUM MOTOR
0.1s
0.1s
CAPSTAN MOTOR

(a) Play, FF and REW modes


PAUSE
REC
REEL MOTOR
②
①
②
2.5s
BRAKE SOLENOID
(MAIN)
B'
B
PINCH SOLENOID
P'
P

(b) Pause mode


FWD
PLAY
REV
PLAY
STILL
PLAY
REEL MOTOR
②
④
①
②
-④
①
②
0.15s
0.1s
B
BRAKE SOLENOID
(MAIN)
B'
P
PINCH SOLENOID
P'

(c) S-FWD, S-REV and Still modes

Note: 1. B : 60 ms after brake switch on
B' : 100 ms after brake switch on
P : 60 ms after pinch switch on
P' : 100 ms after pinch switch on

2. The alarm mode is entered if brake switch and pinch switch are not turned on or off within 2.5 seconds after the main and pinch solenoid operate at the above timings.

3. The shaded sections are held by solenoid latching after energizing.

Fig. 3-11 Mechanism control timing chart

3.4.5 LCD counter

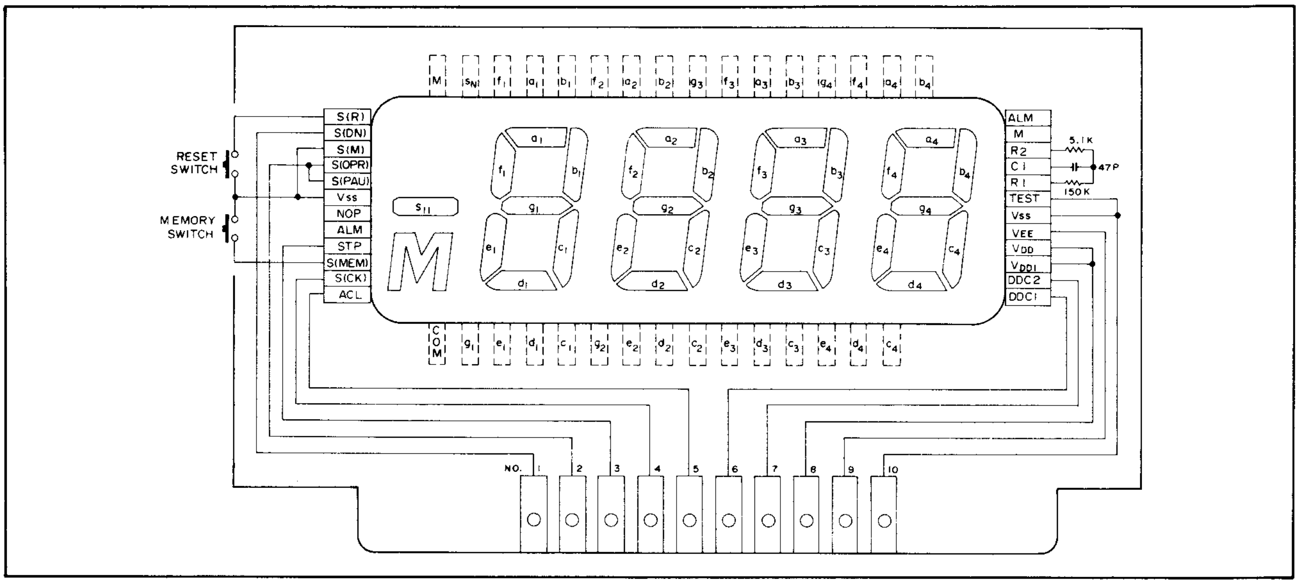

RESET SWITCH
MEMORY SWITCH
S(R)
S(DN)
S(M)
S(OPR)
S(PAU)
Vss
NOP
ALM
STP
S(MEM)
S(CK)
ACL
ALM
M
R2
C I
R I
TEST
Vss
VEE
VDD
VDD1
DDC2
DDC1
5.1K
47P
150K
NO.
1
2
3
4
5
6
7
8
9
10

Fig. 3-12 Terminal diagram

This counter module (S-8018V) is a 3 ½ digit up/down counter which functions in reference to a CR oscillator (48 kHz). Liquid crystal display elements with silver back are used, and digit height is 5 mm.

1. Functions
   1) Maximum count is ± 1999.
   2) Memory stop (zero detecting function)
   3) Counter resettings
   4) Count-up and count-down modes
   5) Tape end detecting function

2. Display format
   1) Character form

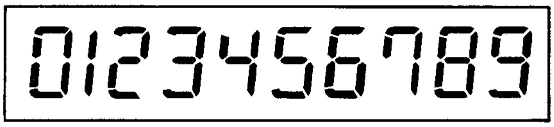


Fig. 3-13

2) Display mode

Count contents	Display
1 9 9 9	1999
− 1 2 0	-120
− 2 0	-20
0	0
M 3 0	M 30

Table 3-8

3. Count functions
   1) Count range

   (a) Up-count

   −1999 → −1998 → ..... −1 → 0 → 1 → 1999

   (b) Down-count

   1999 → 1998 → ..... 1 → 0 → −1 → ..... −1999

   2) Count input period

   The count input signal waveform is as follows:

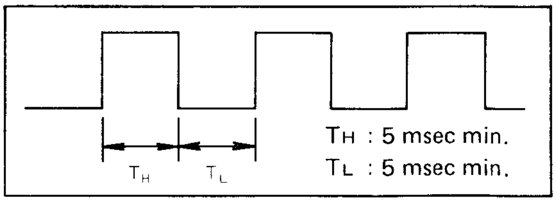

TH
TL
TH : 5 msec min.
TL : 5 msec min.

Fig. 3-14

3) Relationship between count input, count content and display

Three count input pulses increment (decrement) the display by ± 1.

4) Count input detection

The count-up mode is detected when the input pulse at terminal S (CK) drops from Vss (substrate voltage) to VDD (drain supply voltage).

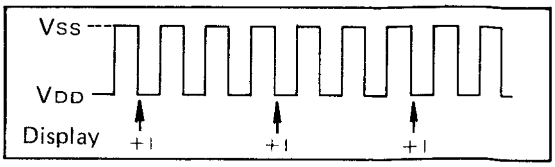

Vss
VDD
Display
+1
+1
+1

Fig. 3-15

Conversely, the count-down mode is detected when the input pulse at terminal S (CK) rises from V_{DD} to V_{SS}.

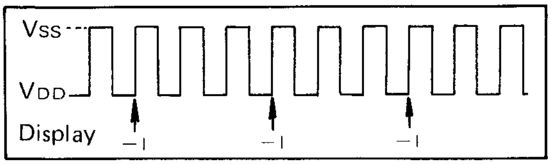


Fig. 3-16

5) Up/down input
V_{DD} at input terminal S(DN) provides count-up and V_{SS} yields count-down. During tape end and memory stop modes, when V_{SS} appears at stop signal output STP, V_{DD} at up/down input S(DN) rises to V_{SS}. The stop output STP then inverts to V_{DD} level.

4. Memory stop (zero detect) mode

1) Memory stop set and release
Pressing the MEMORY button sets the memory stop mode, at which time the letter M appears in the display. This changes the connection of S (MEM) from V_{DD} (or open) to V_{SS}. Release the mode by again pressing the MEMORY button (the M display extinguishes). Operating the MEMORY button does not affect the counter contents or other portions of the display.

2) Memory stop (zero detect) operation
In the memory stop mode, when the counter indication changes to zero, V_{SS} level appears at stop signal output STP. However, if the RESET button is pressed to reset the display to zero, STP remains at V_{DD}.

When the counter contents reach zero from a value other than zero in the memory stop mode, V_{SS} level is obtained from STP output. The memory stop mode is released and the M display extinguishes.

While the counter is at zero, setting the MEMORY switch to ON does not produce V_{SS} from stop output terminal STP which remains at V_{DD}.

During the actual memory stop operation, when S (OPR) rises from V_{DD} to V_{SS}, STP output inverts to V_{DD}.

5. Tape end detector

End of tape is detected when V_{SS} appears at S (OPR) input and pulse is absent at count input S (CK) for 4 to 8 seconds. At this time, STP output is V_{SS} level. When the S (OPR) rises from V_{DD} to V_{SS}, STP output inverts to V_{DD}.

6. Input terminal S(OPR) states

V_{SS} input appears at this terminal during operating modes (Play, Record, FF, REW, Search, etc.). During stopped modes (including Pause), the input level is V_{DD}.

7. Chatter killer

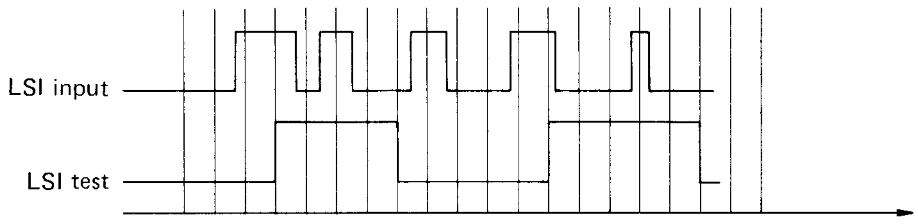
Switch chatter compensation is employed for input terminals S (OPR), S (DN), S (MEM), S (R) and S (CK). Timing functions are shown in Fig 3-17.

8. Initial settings

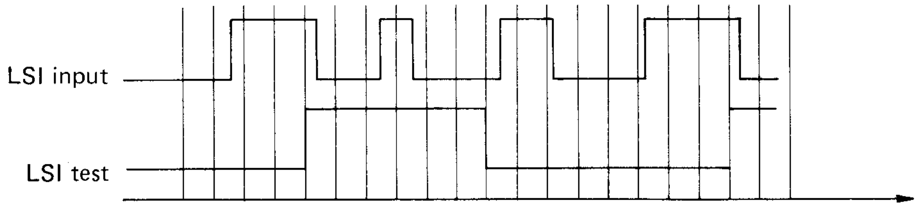
Connecting the all clear (ACL) input terminal to V_{DD} resets the LSI and its outputs.

Counter display	:	0
Memory stop	:	Released (M symbol extinguished)
Stop terminal (STP)	:	V_{DD} level output

The above states are held while ACL is V_{DD}.



(a) Input terminal other than S(CK) (3.9 ~ 7.8 ms/div)



(b) S(CK) (0.25 ~ 0.5 ms/div)

Fig. 3-17

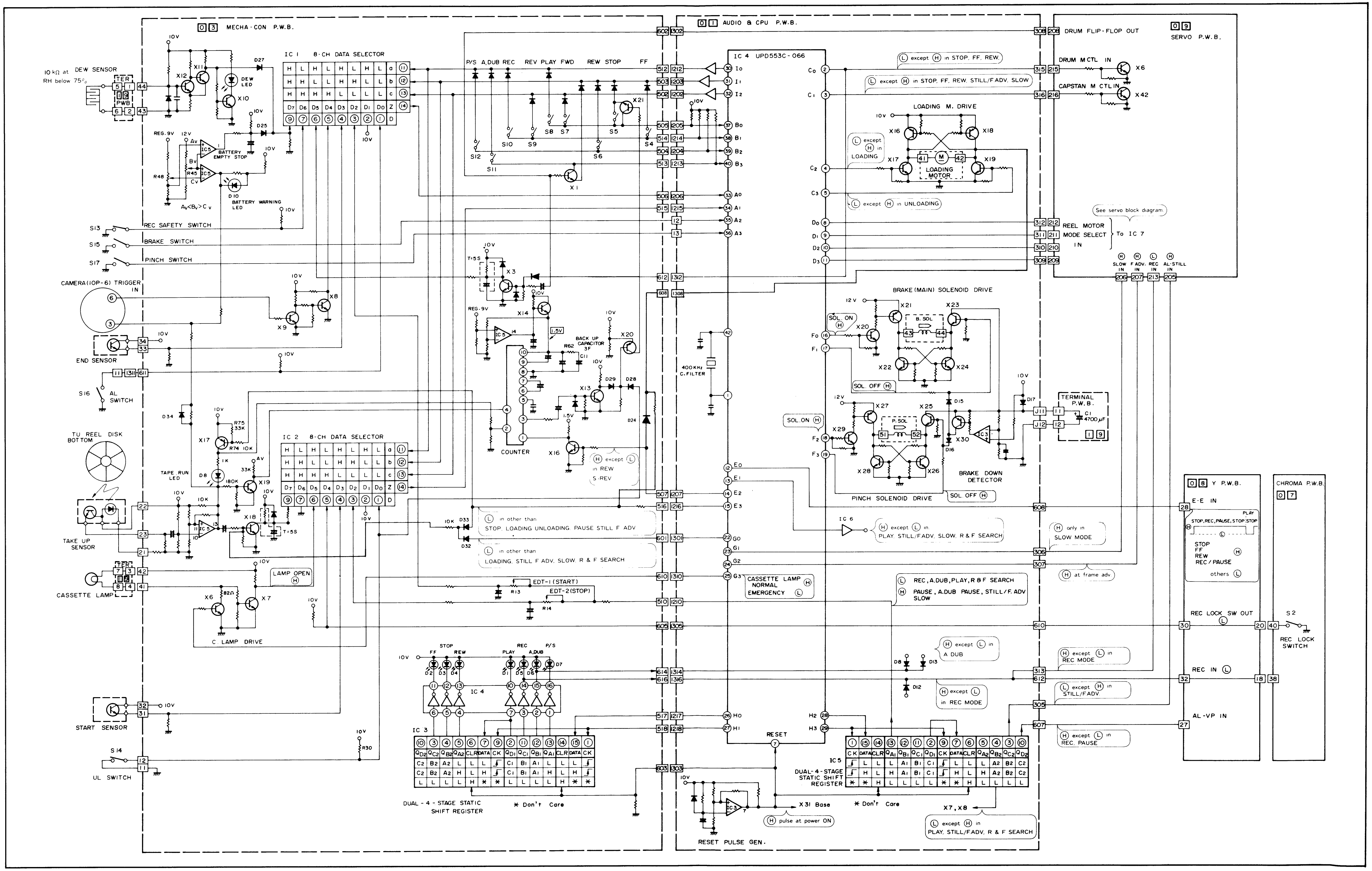

03 MECHA-CON P.W.B.
01 AUDIO & CPU P.W.B.
09 SERVO P.W.B.
08 Y P.W.B.
CHROMA P.W.B. 07
10 kΩ at RH below 75%
DEW SENSOR
DEW LED
TER 19 PWB
REG. 9V
BATTERY EMPTY STOP
BATTERY WARNING LED
Av<Bv>Cv
REC SAFETY SWITCH
BRAKE SWITCH
PINCH SWITCH
S13
S15
S17
CAMERA (10P-6) TRIGGER IN
END SENSOR
S16 AL SWITCH
TU REEL DISK BOTTOM
TAPE RUN LED
TAKE UP SENSOR
CASSETTE LAMP
LAMP OPEN (H)
C LAMP DRIVE
START SENSOR
S14 UL SWITCH
IC 1 8-CH DATA SELECTOR
IC 2 8-CH DATA SELECTOR
P/S A.DUB REC REV PLAY FWD REW STOP FF
S12 S11 S10 S9 S8 S7 S5 S6 S4
COUNTER
BACK UP CAPACITOR 3F
(H) except (L) in REW S-REV
(L) in other than STOP, LOADING UNLOADING PAUSE STILL F ADV
(L) in other than LOADING, STILL F ADV, SLOW, R & F SEARCH
EDT-1 (START)
EDT-2 (STOP)
STOP FF REW REC PLAY A.DUB P/S
IC 3
DUAL-4-STAGE STATIC SHIFT REGISTER
✱ Don't Care
IC 4 UPD553C-066
400KHz C.FILTER
CASSETTE LAMP (H) NORMAL EMERGENCY (L)
RESET
RESET PULSE GEN.
X31 Base
(H) pulse at power ON
IC 5 DUAL-4-STAGE STATIC SHIFT REGISTER
X7, X8
(L) except (H) in PLAY, STILL/F.ADV, R & F SEARCH
(L) except (H) in STOP, FF, REW.
(L) except (H) in STOP, FF, REW, STILL/F.ADV, SLOW
LOADING M. DRIVE
LOADING MOTOR
(L) except (H) in LOADING
(L) except (H) in UNLOADING
BRAKE (MAIN) SOLENOID DRIVE
B.SOL
SOL. ON (H)
SOL. OFF (H)
P.SOL
PINCH SOLENOID DRIVE
BRAKE DOWN DETECTOR
TERMINAL P.W.B.
C1 4700μF
IC 6
(H) except (L) in PLAY, STILL/F.ADV, SLOW, R & F SEARCH
(L) REC, A.DUB, PLAY, R & F SEARCH
(H) PAUSE, A.DUB PAUSE, STILL/F.ADV SLOW
(H) except (L) in A DUB
(H) except (L) in REC MODE
(H) only in SLOW MODE
(H) at frame adv.
(H) except (L) in REC MODE
(L) except (H) in STILL/F.ADV.
(H) except (L) in REC. PAUSE
DRUM FLIP-FLOP OUT
DRUM M CTL IN
CAPSTAN M CTL IN
See servo block diagram
REEL MOTOR MODE SELECT IN
To IC 7
SLOW IN
F.ADV. IN
REC IN
AL-STILL IN
E-E IN
PLAY
STOP, REC, PAUSE, STOP
STOP FF REW REC/PAUSE (H)
others (L)
REC LOCK SW OUT
REC IN (L)
AL-VP IN
S2 REC LOCK SWITCH

Fig. 3-18 Mechanism control circuit

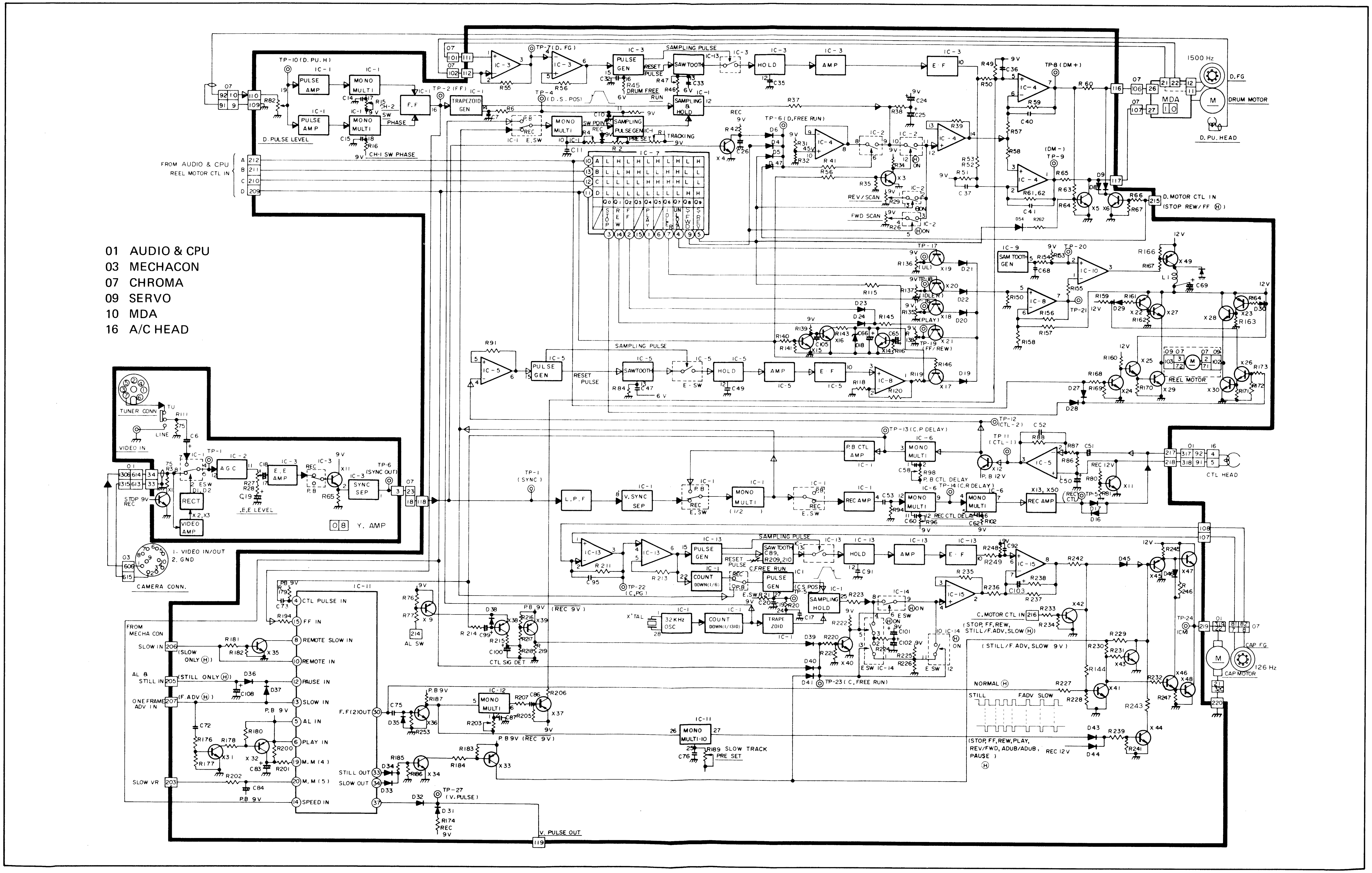

01 AUDIO & CPU
03 MECHACON
07 CHROMA
09 SERVO
10 MDA
16 A/C HEAD
TP-10 (D. PU. H)
PULSE AMP
MONO MULTI
F.F
TRAPEZOID GEN
D. PULSE LEVEL
CH-1 SW PHASE
CH-2 SW PHASE
FROM AUDIO & CPU REEL MOTOR CTL IN
TP-7 (D. FG)
TP-2 (FF)
TP-4 (D.S. POS)
PULSE GEN
RESET PULSE
SAWTOOTH
SAMPLING PULSE
HOLD
AMP
E-F
DRUM FREE RUN
SAMPLING & HOLD
SAMPLING PULSE GEN
PRESET
TRACKING
TP-6 (D. FREE RUN)
TP-8 (DM+)
TP-9 (DM-)
1500 Hz
D. FG
DRUM MOTOR
MDA
D. PU. HEAD
D. MOTOR CTL IN (STOP REW/FF Ⓗ)
REV/SCAN
FWD SCAN
TP-17
TP-18
TP-19 (FF/REW)
TP-20
TP-21
REEL MOTOR
TUNER CONN
VIDEO IN
LINE
AGC
E.E AMP
E.E LEVEL
RECT
VIDEO AMP
SYNC SEP
TP-6 (SYNC OUT)
08 Y. AMP
STOP 9V REC
1- VIDEO IN/OUT
2, GND
CAMERA CONN.
TP-1 (SYNC)
L.P.F
V. SYNC SEP
TP-13 (C.P DELAY)
P.B CTL AMP
TP-12 (CTL-2)
TP 11 (CTL-1)
P.B CTL DELAY
TP-14 (C.R DELAY)
REC AMP
REC CTL DELAY
CTL HEAD
TP-22 (C.PG)
COUNT DOWN (1/6)
C. FREE RUN
TP-5 (C.S. POS)
32 KHz OSC
COUNT DOWN (1/1310)
TRAPEZOID
X'TAL
TP-23 (C. FREE RUN)
C. MOTOR CTL IN
(STOP, FF, REW, STILL/F.ADV, SLOW Ⓗ)
(STILL/F.ADV, SLOW 9V)
NORMAL Ⓗ
STILL FADV SLOW
(STOP, FF, REW, PLAY, REV/FWD, ADUB/ADUB, PAUSE) Ⓗ
REC 12V
CAP FG
CAP MOTOR
126 Hz
TP-24
FROM MECHA CON
SLOW IN
(SLOW ONLY Ⓗ)
AL & STILL IN
(STILL ONLY Ⓗ)
ONE FRAME ADV IN
(F. ADV Ⓗ)
SLOW VR
CTL PULSE IN
FF IN
REMOTE SLOW IN
REMOTE IN
PAUSE IN
SLOW IN
AL IN
PLAY IN
M.M (4)
M.M (5)
SPEED IN
F.F (2) OUT
STILL OUT
SLOW OUT
CTL SIG DET
AL SW
MONO MULTI-10
SLOW TRACK PRE SET
TP-27 (V. PULSE)
V. PULSE OUT
(REC 9V)
P.B 9V (REC 9V)

Fig. 3-19 Servo block diagram

3.5 SERVO CIRCUITS

3.5.1 Outline

Three servo circuits are used in this model: drum, capstan and reel. These are located on the SERVO board, while the drum motor drive (MDA) circuit is contained on a separate board.

1. Drum servo

   The video head drum is driven directly by a DC motor. An FG (frequency generator) pulse is produced by the combination of sixty rotating magnets and detector coils (FG board). The 1.5 kHz pulse is detected to perform speed servo control. At the same time, the rotating drum shaft includes a pulse generator (PG) which provides a 25 Hz pulse signal which is compared in phase with the vertical sync component of the input video signal. Phase control is thus performed to maintained fixed head drum rotation.

   During playback, a 25 Hz reference signal is obtained from a crystal oscillator. This is compared in phase with the 25 Hz drum pulse for controlling video head drum rotation.

2. Capstan servo

   A DC motor and belt drive the capstan. The capstan servo circuit functions to maintain fixed tape speed. The capstan flywheel includes 68 magnets which are detected by coils of the FG board. The resulting 126 Hz pulse is used for speed servo control.

   At the same time, the FG pulse is divided to become a 25 Hz comparison signal. This is compared with a reference signal obtained from a crystal oscillator to perform phase control and maintain fixed rate capstan rotaion.

   The control signal for playback reference is supplied to the control head for recording on the tape. During playback, the control signal from the tape is used as the comparison signal in place of the FG pulse. Phase is compared in the same manner as during recording to regulate capstan rotation.

3. Reel servo

   Speed servo is applied to the reel motor during the shuttle search mode by detecting the control signal of the tape. At other times, the reel servo functions to maintain stable tape winding.

3.5.2 Block diagram descriptions

1. Drum servo circuit signal flow

(1) Recording

The vertical sync component of the video signal is used for drum servo reference during recording. Composite sync is separated from the input video signal and applied from the Y board to terminal 118 of the SERVO board. The signal goes to a sync detector (X4) and to a lowpass filter (LPF) which passes the vertical sync component.

After separation, the vertical sync frequency is divided to 1/2 and branched in two directions. One of these goes through an electronic switch to the recording phase control circuit (monostable multivibrator). The other via another monostable, is amplified and supplied to the control head for recording on the tape as the control signal.

In the recording phase control circuit, R4 adjusts the monostable time constant to control the rotating head phase (position). Each of the two rotating heads covers one TV field and switching between the heads is performed at a point just before the vertical sync signal. This prevents switching noise from appearing in the picture. Afterwards, the signal is supplied to the phase comparator circuit.

The 25 Hz pulse corresponding to the rotating head phase is supplied from the drum pickup head to terminal 110. The pulse is amplified and triggers monostables of the pulse phase control circuit. In this manner, the monostable rise pulse compensates for mechanical errors in the mounting positions of the two magnets.

The monostable rise component triggers the next stage bistable multivibrator circuit to produce a 25 Hz symmetrical squarewave. This signal is sent from terminal 105 (FF-1 OUT) to terminal 5 of the CHROMA board for FM signal switching, and from terminal 208 (FF-2 OUT) to terminal 308 of the AUDIO & CPU board. The signal is also supplied to IC11 pin 15 for controlling variable speed playback (Slow, Still and Frame Advance), and to the trapezoid converter.

In the phase comparator (sample & hold) circuit, the slanting component of the trapezoidal waveform is sampled by the pulse obtained from the recording phase control circuit. This converts phase variation into voltage variation to yield an error voltage. A loop filter composed of R37, R38 C24 and C25 determines the response characteristic of the error voltage, which is then supplied to the mode selector circuit of IC2.

IC2 is a 4 circuit electronic switch that becomes ON with high potential at the control terminal and OFF with low potential. The error voltage through this switch is amplified by IC4 (pins 12, 13 and 14) and supplied to the invert terminal of a differential amplifier.

In another route, the 1.5 kHz FG pulse, which corresponds to the drum rotating speed, is supplied to terminal 112. The pulse is amplified, shaped and applied to the pulse generator circuit. This circuit generates sampling and reset pulses, and the ramp voltage of the sawtooth waveform is sampled.

C35 holds the error voltage and after amplification and impedance conversion (error voltage is inverted), the voltage is applied to the noninvert terminal of the differential amplifier.

Of the two differential amplifier outputs, TP8 (DM+) is for positive torque and TP9 (DM−) for reverse torque. When the output of either TP8 or TP9 exceeds approximately 5.5 V, the motor drive circuit functions and the motor begins turning. Output switching for TP8 and TP9 is performed by resistance dividing the output of a discriminator circuit (pin 10 of IC3) and switching the IC4 differential amplifier outputs. Threshold voltage of the discriminator is approx. 2.2 V.

Above this value, TP8 voltage is higher than TP9, while TP9 voltage is higher at below 2.2 V. The resulting output goes to the motor drive amplifier (MDA).

The MDA performs DC amplification of the differential amplifier output and in accordance with the error voltage, supplies current to the motor drive coil. See also the drum motor drive circuit (Section 3.5.12).

(2) Playback

During playback, the reference signal is obtained from a crystal oscillator located on the SERVO board. IC1 of the SERVO board produces 32.768 kHz, which is counted down 1/1311 to become 25 Hz. This signal goes through an electronic switch to the playback phase control circuit (same monostable system as during recording).

Tracking controls R1 and R2 adjust the monostable time constant and thus regulate the rotating head phase (position) so that the rotating heads trace the recorded signal tracks. This control signal is supplied to the phase comparator and becomes the sampling pulse. Comparison signal flow is the same as during recording.

2. Capstan servo signal flow

(1) Recording mode

The crystal oscillator of SERVO board IC1 produces 32.768 kHz which is counted down 1/1311 to 25 Hz. This becomes the reference signal supplied to the trapezoid generator. The resulting trapezoidal waveform goes to the phase comparator.

At the same time, the 126 Hz FG pulse, corresponding to the capstan rotation, is applied to terminal 108. IC13 amplifies the signal and after waveform shaping, IC1 counts the frequency down to 1/5th. The resulting 25 Hz goes via an electronic switch to the sampling pulse generator, then after additional waveform shaping to the phase comparator.

The phase comparator produces an error voltage by converting phase variation into voltage variation. Via the capstan free running switching circuit of IC14, the error voltage is applied to a loop filter composed of R223, R224, C101 and C102. The loop filter determines the response characteristic of the error voltage. 1C15 amplifies and supplies the voltage to the invert terminal of the differential amplifier.

In another route, the FG pulse is amplified in IC13 and applied to the pulse generator circuit of IC13. This circuit produces sampling and reset pulses; the ramp voltage of the sawtooth waveform is sampled, and the error voltage obtained. C91 holds the error voltage, which is amplified, impedance converted (error voltage inverted) and applied to the non-invert terminal of IC15 differential amplifier. The voltage from the differential amplifier goes through the motor drive circuit to the capstan motor and controls tape speed.

(2) Playback mode

Reference signal and speed control are the same as for recording.

The control head picks up the control signal from the tape and supplies it to terminal 217.

The signal is amplified by IC5 and X12, and goes to the phase monostable of IC6. The phase is delayed by about 20 msec in order to preserve its relationship with that during recording. Via IC1 control amplifier, pulse counter and electronic switches, the signal is supplied to the phase comparator. Operations after the phase comparator are the same as for recording.

In the shuttle search mode, the control signal is played back at about 10 times its normal frequency, producing a large change in the sampling error voltage. Consequently, in this mode, IC14 electronic switch and IC13 discriminator circuits operate so that the capstan motor rotates at nearly the same rate as during the play mode.

3.5.3 Reel servo signal flow

The reel servo circuit regulates reel motor and consequently reel disk rotation according to mode. In modes other than shuttle search, the control signal from the AUDIO & CPU board is decoded at IC7. Through electronic switches X18 to X21 and voltage setting resistors R135 to R138, the signal goes as the mode reference voltage to IC8 opamp (operational amplifier).

IC10 voltage comparator compares the opamp output with the voltage from IC9 oscillator. The comparator output is amplified by X49 and converted to a DC voltage by a filter circuit. This is supplied to both the reel motor drive circuit and the reverse phase input of IC8 as feedback for maintaining fixed rate rotation of the reel motor.

In the shuttle search mode, the pinch roller is separated from the capstan. Reel motor rotation is transferred to the reel disks to perform tape transport. The tape speed becomes about 10 times that of the normal play mode and at this time, the reference voltage for driving the reel motor is obtained from the control pulse.

The playback control pulse picked up by the control head is amplified by IC5 and X12, then returned to the sampling & hold circuit of IC5 where the error voltage is detected. This voltage is amplified by IC5 and IC8 to become the shuttle search mode reference voltage through X17 electronic switch. Signal flow from this point is the same as for other modes.

3.5.4 Sampling & hold circuit

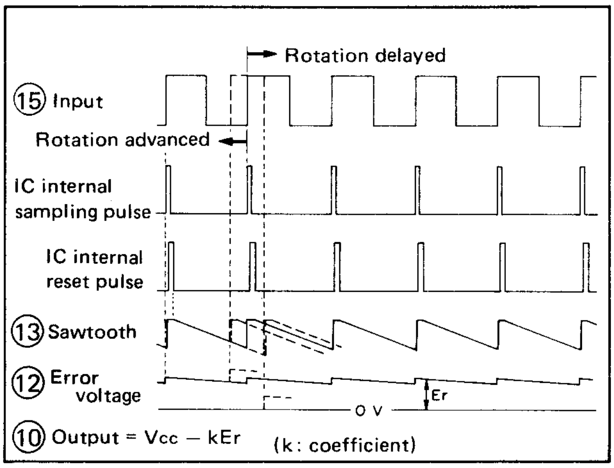


Fig. 3-20 Sampling & hold

Fig. 3-20 shows the timing chart for this circuit. In absence of an input signal (stop mode, etc.) or when the input signal frequency is very low (motor starting period), the output voltage becomes high. This high becomes the voltage flow for increasing the motor speed.

When the motor speed increases, the sampling voltage increases by the timing shown in the figure and the output voltage decreases. By setting the time constant of the sawtooth waveform, the sampling voltage required for maintaining fixed motor rotation can be obtained.

3.5.5 Drum motor control circuit

High potential at terminal 215 of the SERVO board switches X6 on, grounding the differential amplifier output. This cuts off voltage to the motor drive circuit and the motor does not rotate. This control signal is supplied from the MECHACON board.

3.5.6 Drum free running circuit

1. In absence of a video signal (sync signal) during the recording mode, high from X4 sync detector sets the mode selector switch of IC2 on. The power supply voltage is divided by R31 and R32 and goes through IC4 (pins 10 and 8) and IC2 electronic switch to become the reference voltage in place of the drum phase error voltage. The discriminator circuit (adjusted by R47) regulates drum motor rotation for approximately 25 Hz. This reduces the time needed for synchronization when an input sync signal becomes available.

2. Drum phase error response characteristic is determined by a loop filter which possesses a very long time constant. Thus, when power on and rec/play are set simultaneously, time is required until the error voltage charges loop filter capacitor C25, increasing the time needed to obtain synchronous rotation of the drum. In order to minimize this effect, high potential at terminal 215 of the SERVO board switches IC2 mode selector on. Since drum free running voltage becomes applied to the loop filter capacitor, the drum lock in time is shortened.

3.5.7 Horizontal correction

1. In this model, the Slow motion mode is produced by alternating between Still and Normal tape speed. This results in a relative speed difference of about 0.5% between the two modes. In order to minimize horizontal instability in the playback picture, a correction pulse is applied to the drum motor when the tape is moving.

2. During the Forward Search mode, the tape is transported at approximately 10 times normal speed. This introduces a relative speed delay of about –4% between the recorded track and the trace of the video heads. As the AFC locking range of most TV receivers becomes exceeded, compensation is performed by IC2 mode selector switch to apply forward scan voltage (adjustable by R26) and increase the motor rotation by approximately +4%.

3. Conversely, the relative speed becomes advanced by about +5% in the Reverse Search mode. At this time reverse scan voltage (adjusted by R29) is applied for approximately –5% delay.

4. Motor inertia must be compensated when returning from the Forward Search to the Normal Play mode. This is done by applying reverse torque from the brake drive circuit. Similar compensation is not applied in the case of switching from the Reverse Search to the Normal Play mode, since the time required for the idler shift operation would largely defeat its effectiveness.

5. MDA protector switch

   As mentioned above, motor forward or reverse torque is determined by high (approx. 5.5 V) at TP-8 or TP-9. If for some reason, high appears simultaneously at both points, current would not flow in the motor coil and risk of transistor breakdown would occur. For this reason, X5 switching bias is set for approx. 5 V at TP-8, which is near the switching voltage of TP-8 and TP-9.

3.5.8 Capstan free run circuit

This circuit functions in the following conditions.

(1) Before completion of loading and the REC mode is not entered, X39 is on and its collector high.

(2) At completion of loading (AL switch on) in the Play mode, and in absence of the control signal, X38 is off and X39 on (collector high).

(3) When high from MECHACON board appears at terminal 209 (Forward or Reverse Search mode).

(4) During Slow or Still (including Frame Advance) mode with high supplied from IC11.

When any of the above conditions is fulfilled, IC14 electronic switch operates. 9 V divided by R225 and R226 is supplied to IC15 amplifier in place of the error voltage from the phase comparator. In absence of the above conditions, capstan motor rotation becomes controlled by IC13 discriminator circuit. This process reduces the time needed for capstan synchronization when changing modes.

3.5.9 Capstan motor control (CM CTL)

Two control systems are used, one for Normal modes and the other for Slow and Still modes.

1. Normal Modes (Stop, FF, REW)

   Control is performed by X42 and X44. High at terminal 216 (controlled from the MECHACON board) switches transistor X42 on. This grounds the differential amplifier output of IC15 and cuts off diode switch D45.

   For example, if X44 is on while D45 is cut off, X45 becomes fully on (bias current set by R243). This switches off motor drive transistor X47 by reverse base bias and the motor does not rotate.

2. Slow and Still modes

   Separate control circuits are used for the Slow and Still, and the Normal modes. Since tape travel is intermittent in the Slow mode, a slow pulse signal is supplied from IC11 (BA841) to the motor control circuit.

(1) High from the MECHACON board is applied to terminal 216 during the Slow and Still modes. This switches X42 on, grounds the output of IC15 differential amplifier and cuts off D45 switch.

(2) During these modes, motor control voltage from IC11 (pins 33 and 34), X33 and X34 is supplied to R229 and R230.

(3) Slow pulse for controlling capstan motor rotation is supplied from IC11 pin 30 to X41.

(4) A sub-control pulse from IC11 pin 27 is supplied to X44.

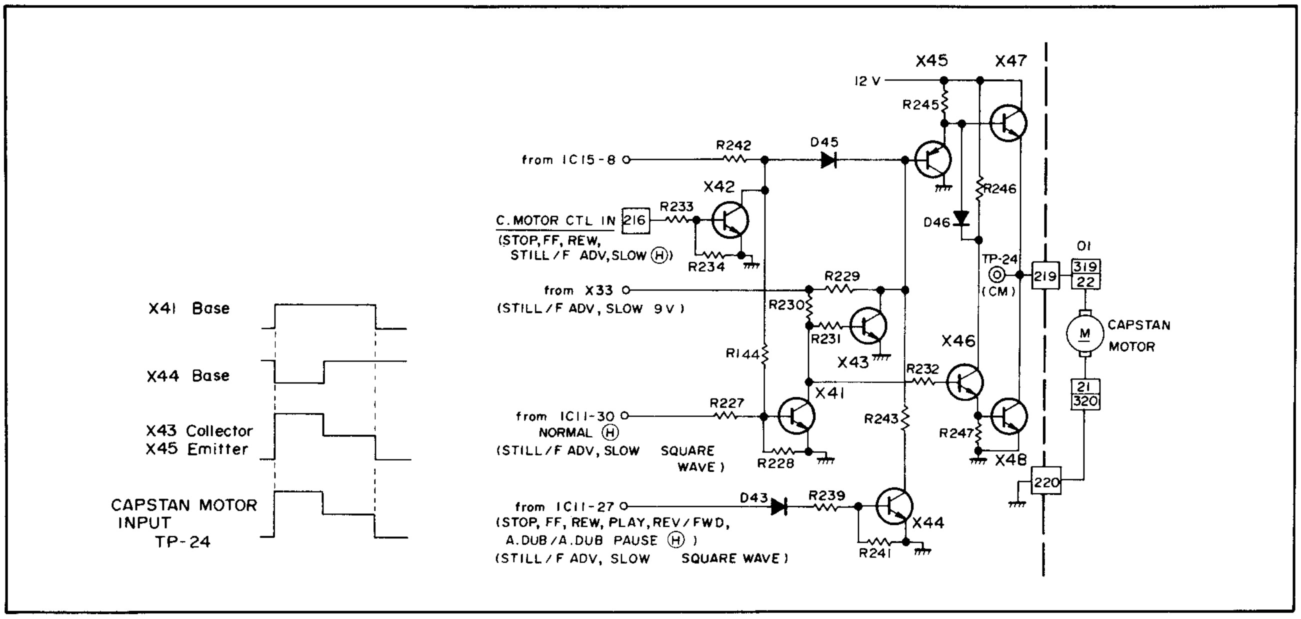

X41 Base
X44 Base
X43 Collector
X45 Emitter
CAPSTAN MOTOR INPUT TP-24
from IC15-8
R242
D45
X45
X47
12 V
R245
X42
R233
C.MOTOR CTL IN
216
(STOP, FF, REW, STILL/F ADV, SLOW Ⓗ)
R234
R246
D46
TP-24
(CM)
219
01
319
22
from X33
(STILL/F ADV, SLOW 9 V)
R229
R230
R231
X43
R144
X46
R232
CAPSTAN MOTOR
M
21
320
from IC11-30
NORMAL Ⓗ
(STILL/F ADV, SLOW SQUARE WAVE)
R227
X41
R228
R243
R247
X48
220
from IC11-27
(STOP, FF, REW, PLAY, REV/FWD, A.DUB/A.DUB PAUSE Ⓗ)
(STILL/F ADV, SLOW SQUARE WAVE)
D43
R239
X44
R241

Fig. 3-21 Slow and Still mode

(5) In the Slow mode, the squarewave pulse rise from IC11 pin 30 switches X41 on, and X43, X46 and X48 off, while the negative pulse switches X44 off. 9 V from X33 goes through R229 to X45 base, nearly cutting off this transistor. The emitter output of X47 goes high and the capstan motor begins rotating. When X44 pulse ceases, high base potential switches X44 on. The voltage divided by R229 and R243 biases X45 and the emitter outputs of X45 and X47 decline. IC11 pin 30 pulse fall switches X43 and X45 on, X47 off, and X46 and X48 on. The motor then stops.

3.5.10 Frame advance circuit

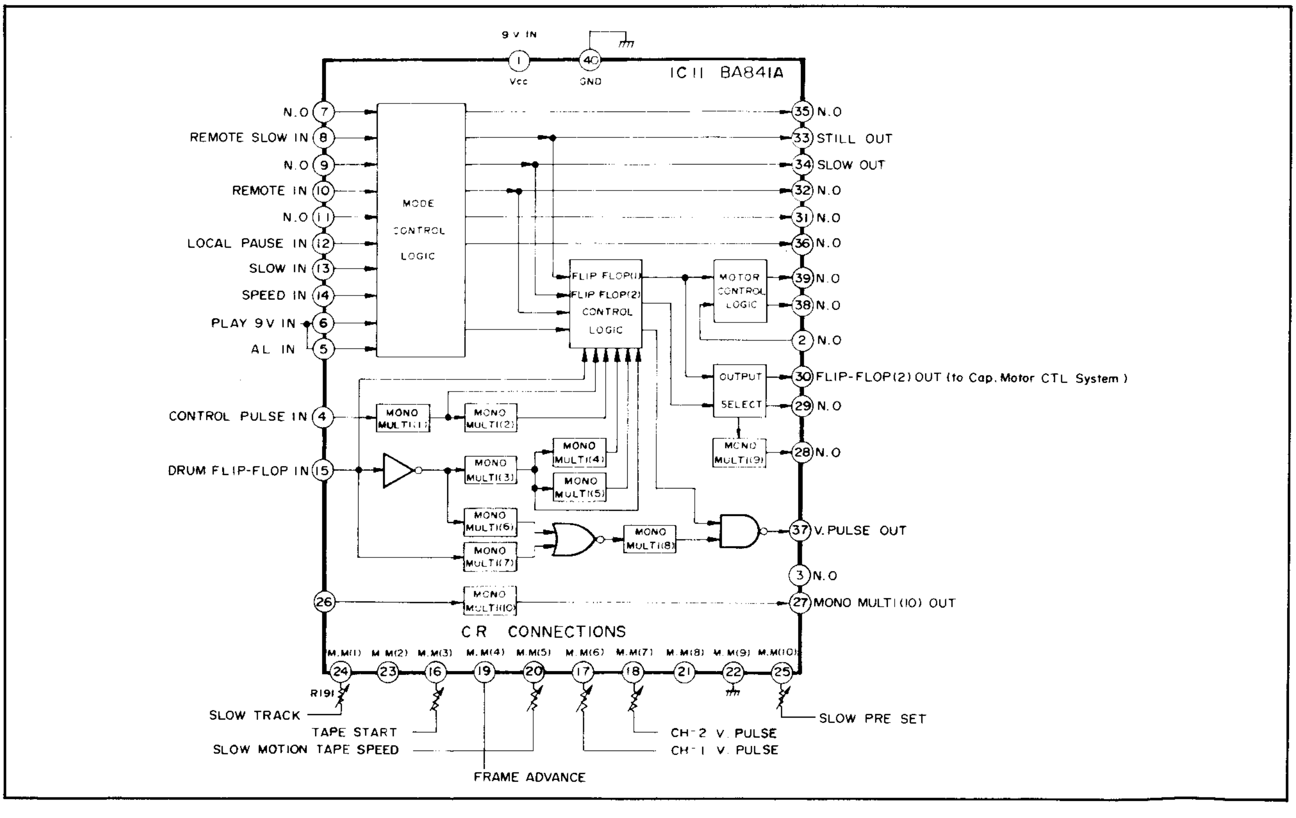

9 V IN
1 Vcc
40 GND
IC11 BA841A
N.O 7
REMOTE SLOW IN 8
N.O 9
REMOTE IN 10
N.O 11
LOCAL PAUSE IN 12
SLOW IN 13
SPEED IN 14
PLAY 9V IN 6
AL IN 5
CONTROL PULSE IN 4
DRUM FLIP-FLOP IN 15
26
MODE CONTROL LOGIC
FLIP FLOP(1)
FLIP FLOP(2)
CONTROL LOGIC
MOTOR CONTROL LOGIC
OUTPUT SELECT
MONO MULTI(1)
MONO MULTI(2)
MONO MULTI(3)
MONO MULTI(4)
MONO MULTI(5)
MONO MULTI(6)
MONO MULTI(7)
MONO MULTI(8)
MONO MULTI(9)
MONO MULTI(10)
35 N.O
33 STILL OUT
34 SLOW OUT
32 N.O
31 N.O
36 N.O
39 N.O
38 N.O
2 N.O
30 FLIP-FLOP(2) OUT (to Cap. Motor CTL System)
29 N.O
28 N.O
37 V.PULSE OUT
3 N.O
27 MONO MULTI(10) OUT
CR CONNECTIONS
M.M(1) M.M(2) M.M(3) M.M(4) M.M(5) M.M(6) M.M(7) M.M(8) M.M(9) M.M(10)
24 23 16 19 20 17 18 21 22 25
R191
SLOW TRACK
TAPE START
SLOW MOTION TAPE SPEED
FRAME ADVANCE
CH-2 V. PULSE
CH-1 V. PULSE
SLOW PRE SET

Fig. 3-22 BA841A

The BA841A IC contains local and remote slow motion inputs. As illustrated in the IC block diagram, the output of monostable 3, which determines the starting position of the capstan motor drive squarewave, is applied to the inputs of monostables 4 and 5. Monostable 5 determines the slow motion speed for remote control unit operation (IC11 pin 8). Ordinarily, monostable 4 regulates the speed for local slow motion, but in this model, it is used for the frame advance function.

Input modes versus outputs for the BA841A as used in this model are indicated in Table 3-10.

Mode inputs and control outputs are shown in Table 3-9.

As indicated in Table 3-9, low at pin 13 produces the Still mode, while high yields the Frame advance mode. When the FR ADV button is pressed, high from the AUDIO & CPU is supplied via terminal 207. At this point, the starting pulse position of pin 30 (FF2 OUT) is determined by monostables 3 (start) and 4 (speed).

During the Slow mode, at the point when both monostables 3 and 4 are charged, monostable 4 becomes triggered and FF2 start pulse rises. When the FR ADV button is pressed, monostable 4 rapidly charges and after a slight delay, FF2 pulse is produced. By holding the FR ADV button depressed, the frames are advanced continuously at the time constant of monostable 4 (about 1 second). See slow and still timing chart of section 9.

Pin No.	Mode Name	STILL	SLOW	SEARCH	PLAY
33	STILL OUT	H	L	L	L
34	SLOW OUT	L	H	L	L
30	FF(2) OUT	L	○	H	H
37	V. PULSE OUT	○	○	○	H

Note: Circle designates square wave pulse.

Table 3-9

3.5.11 Reel motor drive circuit

A switching regulator circuit is employed for driving the reel motor. By switching the control transistor on and off, and using a transistor (X49) with low VCE (collector to emitter voltage), electrical power can be used effectively.

The reference voltage is amplified about 1.5 times and sent to the output. Test points and voltages are listed in Table 3-11.

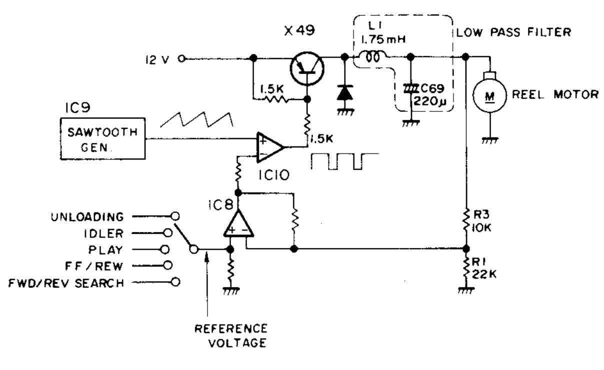


Fig. 3-23

Mode	Check point	Adjusting point	Voltage value
PLAY	CN1-102	R135	2.3
UNLOADING	CN1-103	R136	2.5
FF (REW)	CN1-102(103)	R137	9.0

Table 3-11

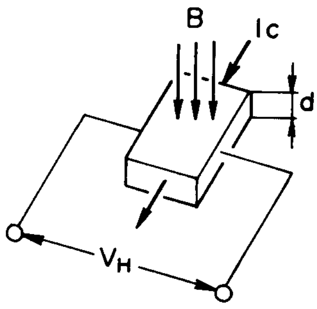
								Output	
Pin No.	5	6	8	10	12	13	14	33	34
Mode \ Pin Name	AL	PLAY	Remote SLOW	Remote	Local PAUSE	Local SLOW	Local SPEED	STILL	SLOW
STILL	H	H		L	H	L		H	
SLOW	H	H	L	H					H
FR. ADV.	H	H		L	H	H			H
SEARCH	H	H		L	L		H		

Table 3-10

3.5.12 Drum motor drive circuit

1. Hall element

   In certain semiconductors, when a current (Ic) flows perpendicular to magnetic lines of force (B), a voltage (V_H) becomes produced which is perpendicular (3 dimensionally) to both the current and magnetic field. This is termed the Hall effect and forms the principle utilized by Hall elements. The basic diagram of a Hall element is shown in Fig. 3-24.



$$V_H = R_H \times \frac{Ic \times B}{d}$$

R_H = material constant (Hall coefficient)

d = conductor thickness

Fig. 3-24 Hall element

2. Direct drive (DD) motor

   This motor is composed of a magnetic outer rotor and an inner coil stator. Hall elements detect the rotor angular position and speed is adjusted by varying the voltage applied to the stator coils.
   A reverse torque circuit is provided in parallel with the Hall detector elements. When required, current is applied to the coils in order to reduce the time needed for synchronized rotation.

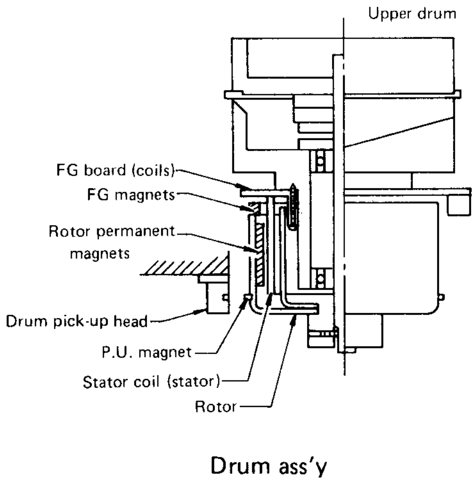


Fig. 3-25

3.5.13 Shuttle search

Shuttle search (FWD and REV) is enabled only during the Play, Slow and Still modes while the appropriate button is pressed. Releasing the button returns the prior mode.

1. Tape pattern and FM output

   Fig. 3-26 illustrates the tape pattern during the Forward and Reverse Shuttle Search modes. Because of the approximately 10 times tape speed, each video head traces 10 recorded tracks. However, due to the 12° azimuth difference, an effective signal output is obtained only when each head traces its corresponding track. The resulting FM output signal becomes a diamond shaped waveform as shown in the figure. Since an output is not obtained when each head traces the other's track, a moving noise bar appears in the playback picture display.

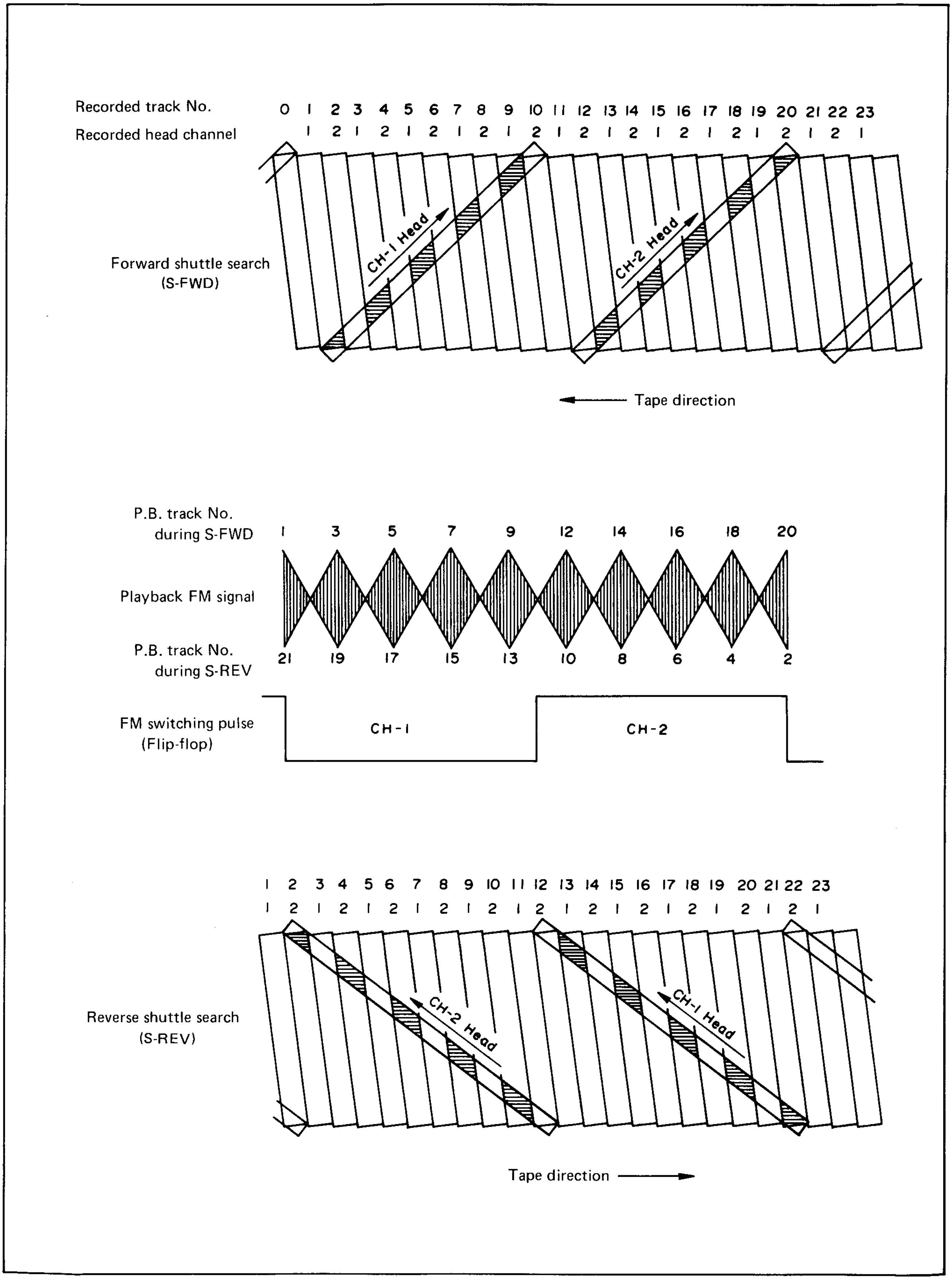

Recorded track No.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Recorded head channel
1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1
Forward shuttle search
(S-FWD)
CH-1 Head
CH-2 Head
Tape direction
P.B. track No.
during S-FWD
1 3 5 7 9 12 14 16 18 20
Playback FM signal
P.B. track No.
during S-REV
21 19 17 15 13 10 8 6 4 2
FM switching pulse
(Flip-flop)
CH-1
CH-2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1
Reverse shuttle search
(S-REV)
CH-2 Head
CH-1 Head
Tape direction

Fig. 3-26 Shuttle search

2. Relative speed

The Shuttle Search mode introduces a large deviation in relative speed between the video heads and the tape. An additional variation is caused by the forward and reverse tape directions.

Relative speed $V_H = D\pi f \pm V_t$

D : Drum diameter
f : Drum rotation rate
V_t : Tape speed

In the forward direction, the relative speed is approximately –4.3% and in the reverse direction it becomes about +5.3%. Since this exceeds the AFC locking range of the average TV receiver, compensation is required in the form of increasing the drum rotation by about 4.3% in the forward mode and delaying it by about 5.3% in the reverse mode.

A synthesized vertical sync pulse is also inserted during the Shuttle Search mode to compensate for the effects of noise on the vertical stability of the picture.

3.6 ACCESSORY CIRCUITS

3.6.1 Battery charging and heater circuits

1. HR-2200E + TU-22E

   Using the TU-22E, a battery pack can be charged under the following conditions.

(1) Rear panel MAINS POWER switch to ON.

(2) Front panel OFF button depressed.

(3) Battery internal thermostat shorted to ground (i.e., battery itself is cool).

(4) At this time, press the front panel CHARGE START button to begin charging.

2. Battery charging with AA-P22E

(1) Front panel POWER button depressed to the ON position.

(2) Battery internal thermostat is shorted to ground.

(3) Press the CHARGE START button to begin charging.

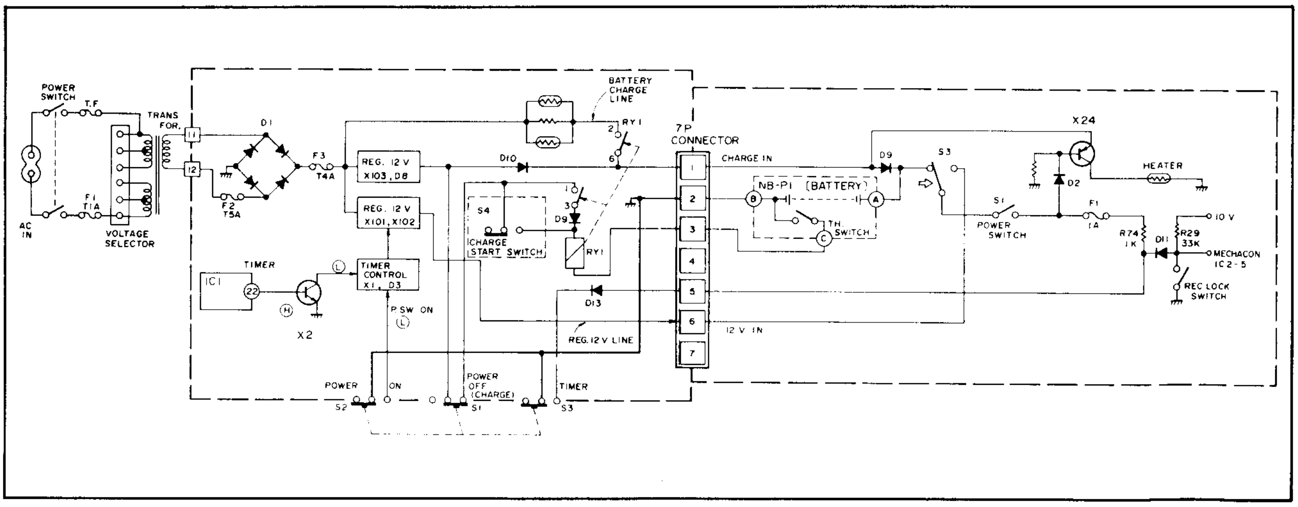

POWER SWITCH
T.F
TRANS FOR.
AC IN
F1 T1A
VOLTAGE SELECTOR
11
12
D1
F2 T5A
F3 T4A
REG. 12 V X103, D8
REG. 12 V X101, X102
BATTERY CHARGE LINE
RY1
2
6
1
3
D10
D9
S4
CHARGE START SWITCH
RY1
TIMER
IC1
22
H
L
X2
TIMER CONTROL X1, D3
P. SW ON
L
D13
REG. 12 V LINE
POWER
S2
ON
POWER OFF (CHARGE)
S1
TIMER
S3
7P CONNECTOR
1
2
3
4
5
6
7
CHARGE IN
12 V IN
NB-P1 (BATTERY)
B
A
C
TH. SWITCH
D9
S3
X24
D2
HEATER
S1
POWER SWITCH
F1
1A
10 V
R74 1K
D11
R29 33K
MECHACON IC2-5
REC LOCK SWITCH

Fig. 3-27 HR-2200E + TU-22E

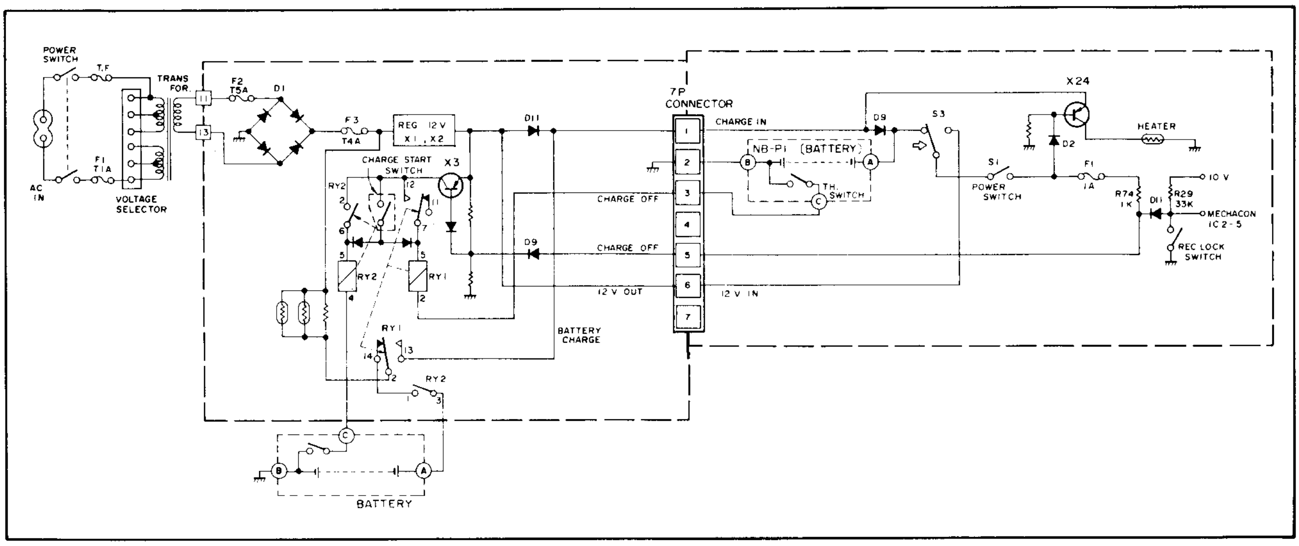

POWER SWITCH
T.F
AC IN
F1 T1A
TRANS FOR.
VOLTAGE SELECTOR
11
13
F2 T5A
D1
F3 T4A
REG 12V X1, X2
D11
CHARGE START SWITCH
X3
RY2
2
6
12
11
7
5
RY2
RY1
4
2
D9
RY1
14
13
RY2
1
3
BATTERY CHARGE
CHARGE OFF
CHARGE OFF
12 V OUT
7P CONNECTOR
1
2
3
4
5
6
7
C
B
A
BATTERY
CHARGE IN
NB-P1 (BATTERY)
B
A
C
TH. SWITCH
12 V IN
D9
S3
X24
D2
HEATER
S1
POWER SWITCH
F1 1A
R74 1K
D11
R29 33K
10 V
MECHACON IC2-5
REC LOCK SWITCH

Fig. 3-28 HR-2200E + AA-P22E

3. HR-2200E + AA-P22E (charging 2 batteries)

(1) With internal thermostats of both batteries grounded and the POWER button of the HR-2200E OFF (raised position), press the CHARGE START button of the AA-P22E to begin charging. The battery in the HR-2200E is charged first (selected by relay RY1 contacts 2, 13, and 14).

(2) After completion of the HR-2200E battery charging, the battery of the AA-P22E begins charging.

(3) While charging is in progress, pressing the HR-2200E POWER button to ON interrupts charging. To resume charging, set the HR-2200E POWER button to OFF and again press the CHARGE START button of the AA-P22E.

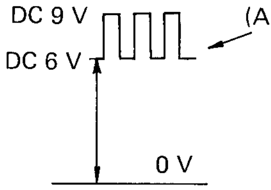
4. Heater operating conditions

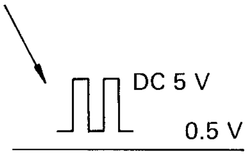
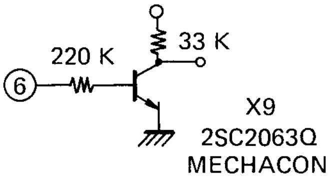
(1) When connected to the TU-22E, with the TU-22E rear panel POWER switch ON and the HR-2200E POWER button OFF, heater voltage is supplied regardless of the function button positions. In this state, although voltage is also supplied to the battery, two diodes are inserted in series and the voltage becomes approx. 10.8 V. The charging effect is thus negligible.

(2) In the HR-2200E + AA-P22E combination, heater voltage is supplied when the AA-P22E POWER button is ON and the HR-2200E POWER button is OFF.

(3) When the HR-2200E is operated by battery, D9 becomes reverse biased. At this time, heater voltage is not supplied.

3.6.2 10 pin camera connector

<table>
<tr><th>MODE
PIN NO.</th><th>E-E (STOP, REC, REW, FF)</th><th>P.B.</th></tr>
<tr><td>1</td><td>VIDEO INPUT : 1 Vp-p (75 Ω)</td><td>VIDEO OUTPUT : 2 Vp-p (no load)
Sync Tip = DC 4 V ± 1 V</td></tr>
<tr><td>2</td><td>GND</td><td>GND</td></tr>
<tr><td>3</td><td colspan="2">BATTERY ALARM & TAPE RUN
<table>
<tr><th>Battery alarm
Tape run</th><th>OFF</th><th>ON (*)</th></tr>
<tr><td>Stop</td><td>H (DC 6 V)</td><td>L (DC 1 V)</td></tr>
<tr><td>Run</td><td>
DC 9 V
DC 6 V
0 V
(Approx. 1 Hz)

</td><td>
</td></tr>
</table>
(*) Battery alarm lights battery terminal voltage declines to 11.0±0.2 VDC.</td></tr>
<tr><td>4</td><td>GND (for 5 pin)</td><td>GND</td></tr>
<tr><td>5</td><td>AUDIO OUT : 0 dBs (no load)
Volume should be sufficient with 10 Ω earphone.</td><td>Z out : 100 Ω</td></tr>
<tr><td>6</td><td>START/STOP
High input = Stop (pause)
Low input = Start (rec)

220 K
33 K
⑥
X9
2SC2063Q
MECHACON

</td><td></td></tr>
<tr><td>7</td><td>AUDIO IN : −20 dBs (8 kΩ)</td><td></td></tr>
<tr><td>8</td><td>GND</td><td>GND</td></tr>
<tr><td>9</td><td>GND</td><td>GND</td></tr>
<tr><td>10</td><td>+ 12 V OUT 1 A</td><td>+12 V OUT 1 A</td></tr>
</table>

Table 3-12

SECTION 4
DISASSEMBLY

4.1 CHASSIS REMOVAL

1. Take out the hook screws and screws ① from both sides, and remove the side plates.
2. Three plastic hooks are located on the inner side of the front panel at roughly the positions of the FF, REC and PAUSE/STILL buttons. Open the bottom of the front panel outward a few degrees, then disengage the hooks to remove the front panel.

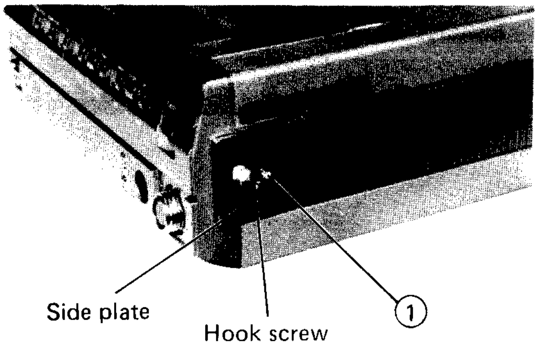


Fig. 4-1

3. Take out screws ② through ④ and remove the feet and the bottom cover.

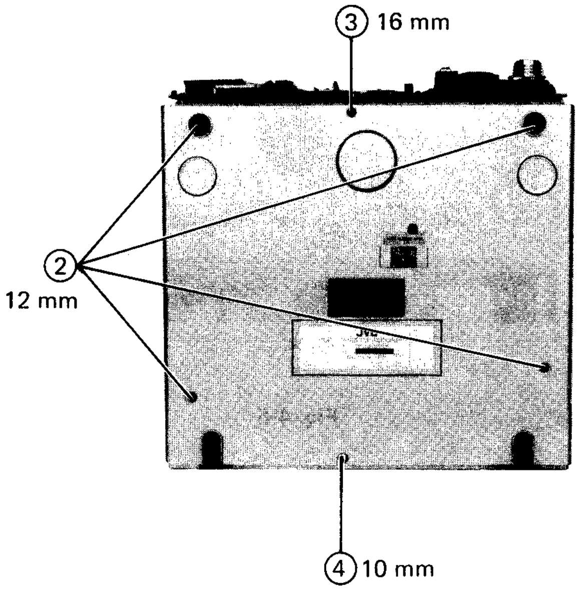


Fig. 4-2 (a)

NOTES:

- *After removing the bottom cover, reinstall screws ② in the convex portions to avoid direct contact between the reel motor and circuit board, and the work surface.*
- *Observe screw lengths when reassembling (Fig. 4-2).*

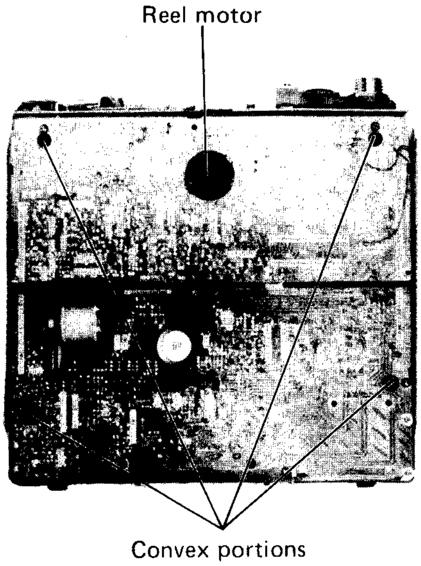


Fig. 4-2 (b)

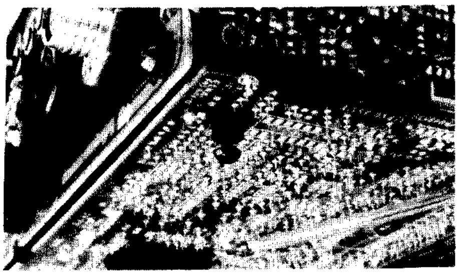


Fig. 4-2 (c)

4. Remove the connector cover.
5. With the cassette housing in the raised position, take out screws ⑤ and remove the top cover.
6. Take out screws ⑥ and remove the shielding plate.

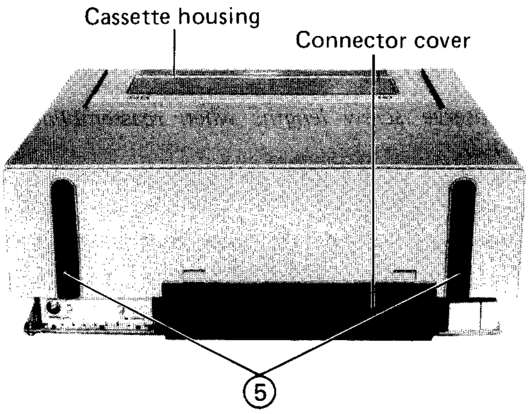

Cassette housing
Connector cover
⑤

Fig. 4-3 (a)

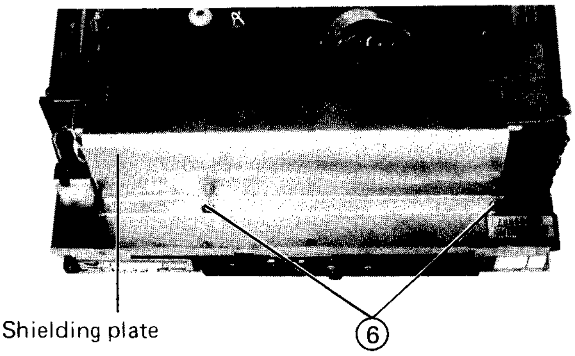

Shielding plate
⑥

Fig. 4-3 (b)

7. Take out screws ⑦ and remove the cassette cover.

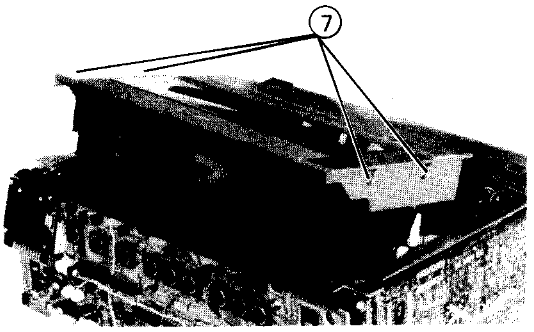


Fig. 4-4

4.2 CIRCUIT BOARD REMOVAL

4.2.1 PRE/REC

1. Take out screws ①.
2. Disengage the connectors and remove the PRE/REC board.

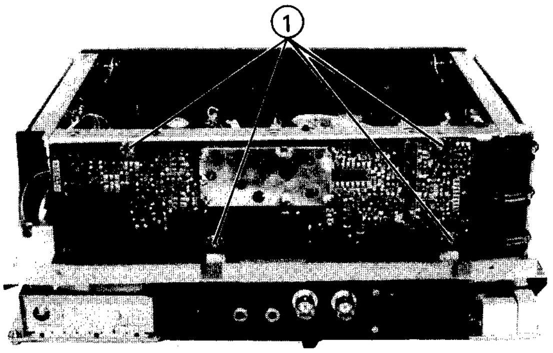


Fig. 4-5

4.2.2 Servo

1. Remove the tracking knobs.
2. Take out screws ②.
3. Disengage the connectors and remove the servo board.

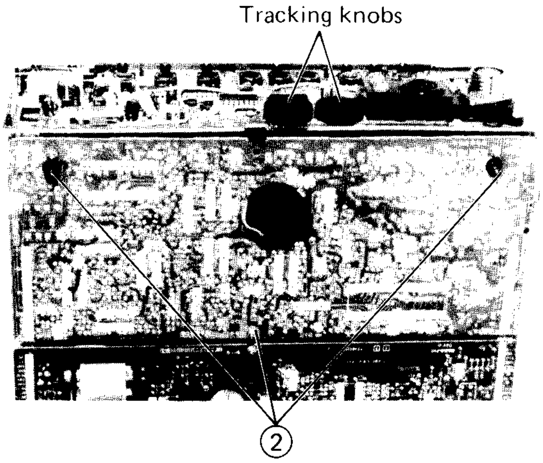

Tracking knobs
②

Fig. 4-6

4.2.3 Y. amplifier

1. Remove screws ③ and screw ④.
2. Disengage the connectors, and remove the Y. amp board.

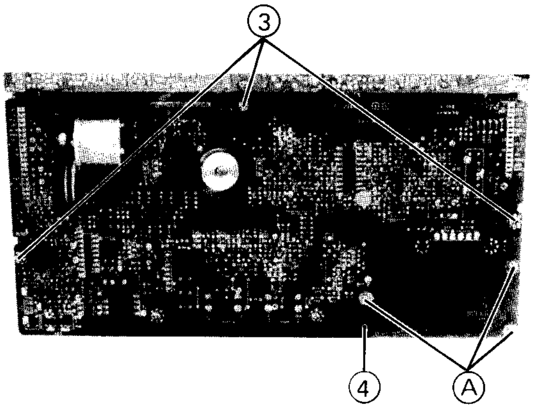


Fig. 4-7 (a)

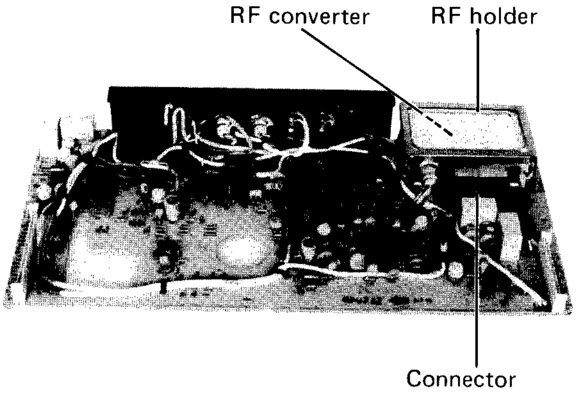


Fig. 4-7 (b)

RF Converter replacement

1. After removing the Y. amp board, take out screws Ⓐ and remove the holder.
2. Disengage the RF converter from the connector.

4.2.4 Chroma

1. Remove the servo and Y. amp boards.
2. Take out screws ⑤.
3. Disengage the connectors and remove the chroma board.

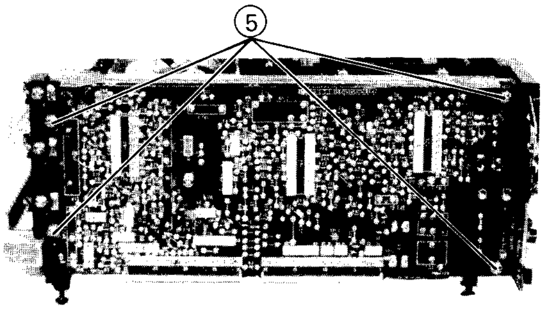


Fig. 4-8

4.2.5 Mechanism control (Mechacon)

1. Remove the servo board.
2. Take out screws ⑥ through ⑧.
3. Disengage the connectors and remove the mechacon board.

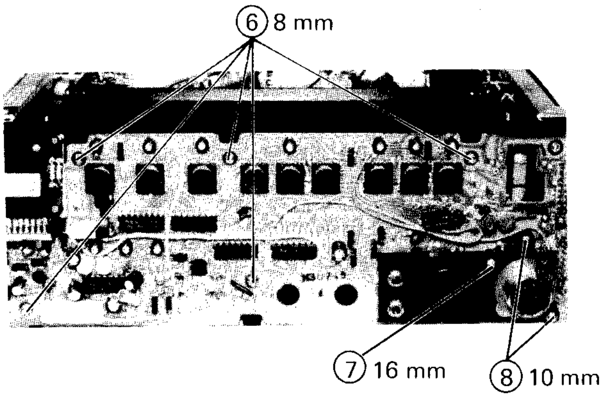


Fig. 4-9

4.2.6 Audio & C.P.U.

1. Remove the servo, Y. amp and mechacon boards.
2. Take out screws ⑨.
3. Disengage the connectors and remove the audio & C.P.U. board.

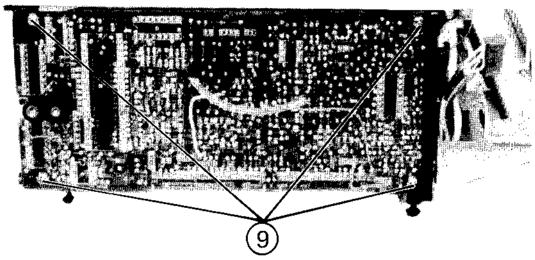


Fig. 4-10

SECTION 5
MECHANICAL ADJUSTMENT

5.1 GENERAL

The adjustments described in this section are those which can be performed by a qualified service technician. Those which require highly specialized equipment and training (such as replacement of the lower drum) are omitted.

Proper maintenance and inspection are important both for ensuring top performance and preventing damage to the tape. Note that the required jigs must be employed when specified in the adjustment steps.

IMPORTANT:

1. *Always turn the power off before removing or soldering components.*
2. *When removing a screw from the chassis, be careful not to drop it into the mechanism. If a screw should be dropped, be sure to retrieve it.*
3. *Be extremely careful not to damage either the upper or lower head drum assemblies.*
4. *The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require readjustment.*
5. *When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the guide poles and rotary video head drum.)*
6. *To check the mechanism without the cassette tape, disable the photo transistor sensors by applying an opaque cover to the cassette lamp holder. After completing checks and repairs, be sure to remove the cover.*

5.2 REQUIRED JIGS AND TOOLS

For proper mechanical adjustment, the following jigs and tools are strongly recommended. Without them, a long trial-and-error period would be necessary.
In addition, general-purpose tools and a metric hex key (not supplied by JVC) are required.
The hex key needed for this model is 1.5 mm size.

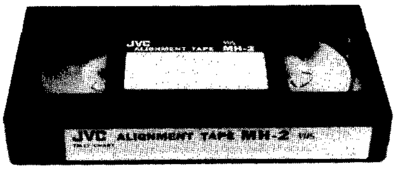
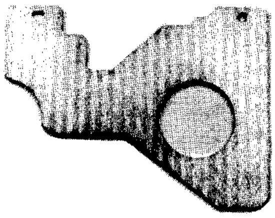
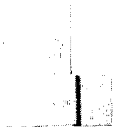
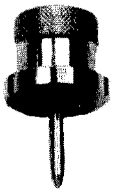
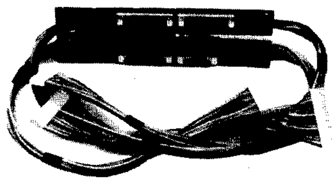
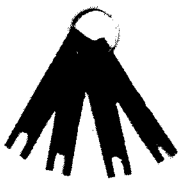
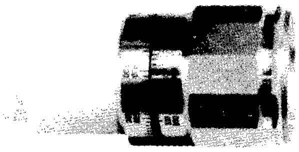
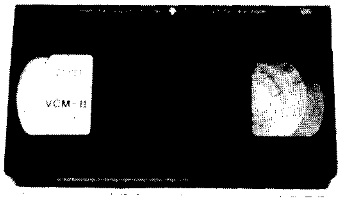
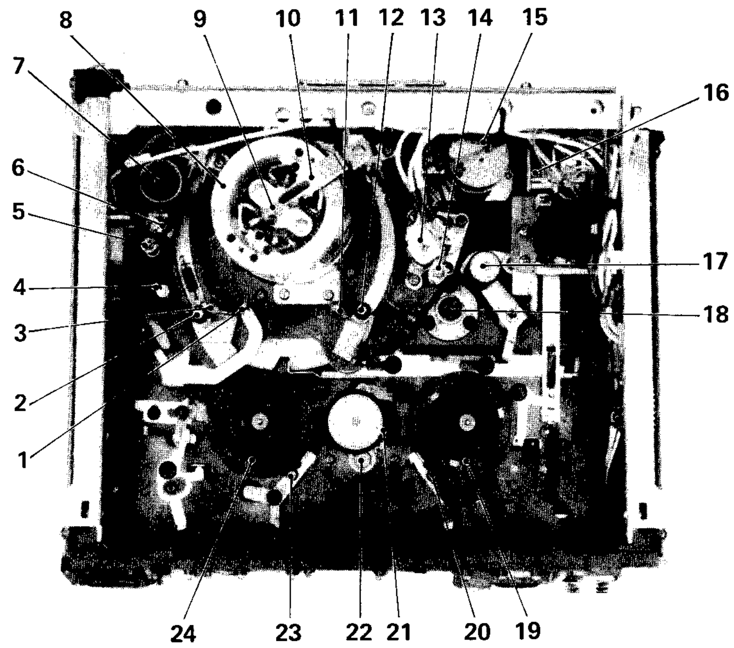
JVC Alignment Tape MH-2  	Master Plane Jig PUJ42146 	Height Gauge PUJ42147 
FG P.W.B. Setting Jig PUJ42148 	Patch cord PUJ42164A 	Thickness Gauge PUJ48017 
Torque Gauge Ass'y PUJ48075-2 Torque meter 600ATG Torque gauge head PUJ48016-2 	Back Tension Cassette Gauge PUJ48076  	JVC Oil PU41761

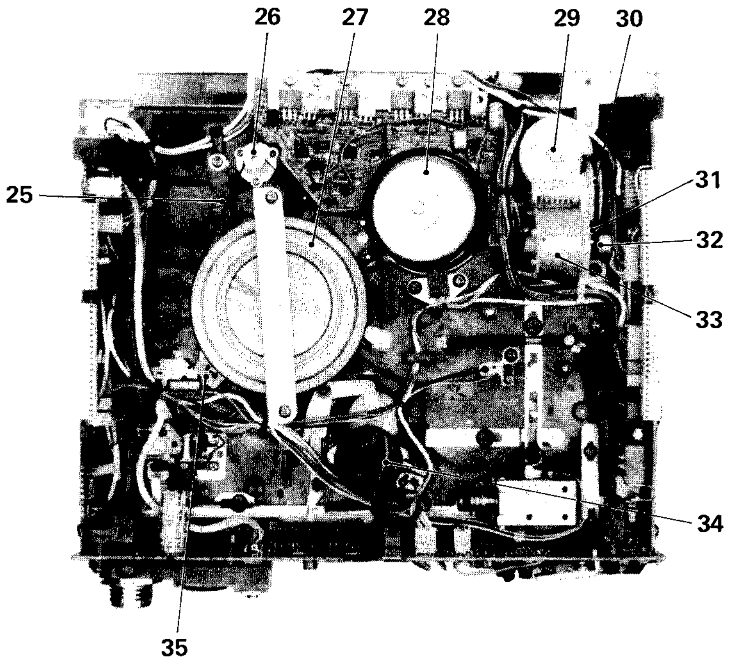
Fig. 5-1 Jigs and tools

5.3 LAYOUT OF MAIN MECHANICAL PARTS



(a) Top view

1	Tension pole
2	Supply guide roller
3	Supply slant pole
4	Supply guide pin
5	Supply guide pole
6	Full erase head
7	Supply impedance roller
8	Upper drum ass'y
9	Commutator
10	Brush ass'y
11	Take-up slant pole
12	Take-up guide roller
13	Audio/Control head ass'y
14	Take-up guide pole
15	Capstan motor ass'y
16	Pinch roller solenoid
17	Pinch roller
18	Capstan shaft
19	Take-up reel disk ass'y
20	Take-up brake rubber tire
21	Reel idler rubber tire
22	Reel motor pulley
23	Supply brake rubber tire
24	Supply reel disk ass'y



(b) Bottom view

25	Capstan belt
26	Capstan motor pulley
27	Capstan flywheel
28	Lower drum ass'y
29	Loading gear ass'y
30	Loading gear pulley
31	Loading belt
32	Loading motor pulley
33	Loading motor
34	Reel motor ass'y
35	FG circuit board

Fig. 5-2

5.4 PERIODIC MAINTENANCE

The following procedures are recommended for maintaining optimum performance and reliability of this video cassette recorder.

5.4.1 Cleaning

1. For cleaning parts except the video heads, use gauze or lint-free cloth dampened with alcohol.
2. When cleaning video heads, use a separate lint-free cloth dampened with alchohol.
3. When cleaning the two video heads on the upper drum, do not clean them with a vertical stroke.
   Use only a gentle back and forth mortion in the direction of the tape path.
   Use care since they are easily damaged.

PART NAME	OPERATING HOURS									
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
Tension pole	C	C	C	C	C	C	C	C	C	C
Supply slant pole										
Supply guide roller										
Supply guide pin										
Supply guide pole										
Supply impedance roller										
Take-up guide pole										
Capstan shaft										
Take-up guide roller										
Take-up slant pole										
Full erase head	C	C	C	C	C	C	C	C	C	R
Audio/control head ass'y	C	C	C	C	C	R	C	C	C	C
Upper drum ass'y	C	R	C	R	C	R	C	R	C	R
Pinch roller	C	C	C	C	C	R	C	C	C	C
Reel motor ass'y		C		R		C		R		C
Capstan motor ass'y		C		R		C		R		C
Loading motor						R				
Loading motor pulley		C		C		C		C		C
Loading gear pulley		C		C		C		C		C
Capstan flywheel		C		C		C		C		C
Reel idler rubber tire		C		R		C		R		C
Supply brake rubber tire		C		R		C		R		C
Take-up brake rubber tire		C		R		C		R		C
Capstan belt		C		R		C		R		C
Loading belt		C		R		C		R		C
Supply reel disk ass'y		C		C/L		C		C/L		C
Take-up reel disk ass'y		C		C/L		C		C/L		C
Brush ass'y		C		R		C		R		C
Commutator		C		R		C		R		C
Supply tension brake ass'y				R				R		
Take-up tension brake ass'y				R				R		
Tension band ass'y				R				R		

Key to abbreviations:
C : Cleaning
L : Lubrication
R : Replacement

Table 5-1 Periodic maintenance

4. When cleaning rubber and plastic parts, avoid using excessive alcohol since it may accelerate deterioration of these parts.
5. After cleaning with alcohol, allow the parts to dry thoroughly before using a cassette tape.

5.4.2 Lubrication

The following components should lubricated with JVC oil after every 2000 hours of use.

1) Shaft of the take-up reel disk
2) Shaft of the supply reel disk

After cleaning above shafts with alcohol, lubricate these shafts with one or two drops of JVC oil
Do not over lubricate.

5.4.3 Periodically replaced parts

The replacement periods of the parts shown in Table 5-1 are typical for equipment that is used in accordance with the instruction manual. Note that the times may vary considerably according to environmental and usage conditions. As a rule, inspect these components whenever performing major service on the machine and replace those which show obvious signs of wear or deterioration.

5.5 MAIN ASSEMBLY REPLACEMENTS

5.5.1 Cassette housing

1. With the cassette housing in the lowered position, disengage the springs from the left and right spring rollers.
2. Gently spread the springs outward and use a magnetic tipped screwdriver to take out screws A.
3. Lift the cassette housing upward and while pressing the release lever, lightly press in the REC safety lever. At this time, lift the cassette housing upward toward the left side. In this manner, carefully remove the cassette housing.
4. Reinstall with the housing in the raised configuration.
5. Gently insert the right side of the cassette housing first and while pressing the release lever, insert the left side. At this time, use care that left stand of the housing does not deform the earth spring at the upper left corner of the frame.
6. Lower the cassette housing. Observe that the main deck bosses are properly seated in the positioning holes of the cassette housing stands, then reinstall screws A.

   Note: If screws Ⓐ are tightened while the bosses are not properly seated, the bosses can be damaged and prevent correct positioning of the cassette housing.
7. Re-engage the springs with the spring rollers.

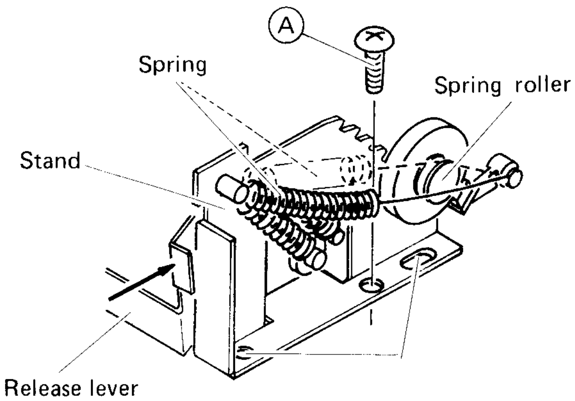


Fig. 5-3 Cassette housing replacement

5.5.2 Upper drum and brush assemblies/commutator

1. Take out screw Ⓐ and remove the brush assembly. See Fig. 5-4.
2. Remove the commutator from the drum motor shaft.
3. Unsolder the 4 wires coming from the lower drum assembly (perform quickly to avoid damaging the wires).
4. Take out screws Ⓑ and remove the upper drum assembly in the upward direction.
5.. Use alcohol to clean the lower face of the new upper drum assembly and the flywheel face of the lower drum assembly. When handling and installing the new upper drum, avoid directly touching the video heads and use care not to scratch the drum.

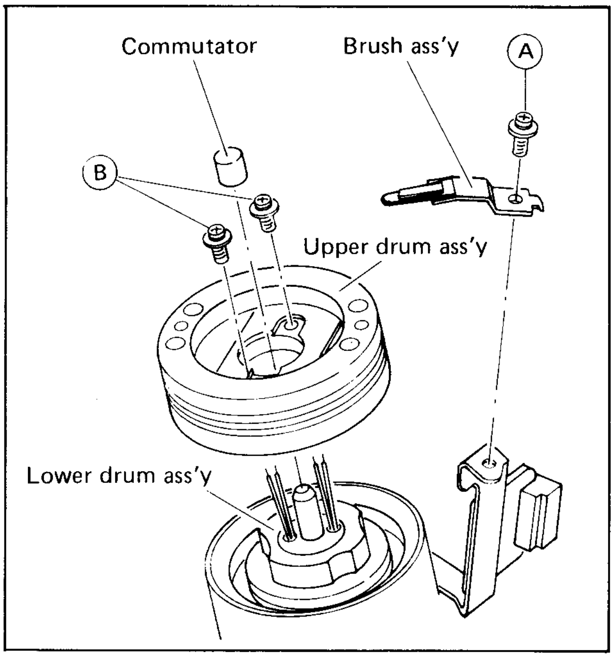


Fig. 5-4 Upper drum and brush/commutator replacements

6. Reassemble by reversing the above steps. Observe the correct channels when resoldering the wires (brown: CH-1; red: CH-2). Avoid overheating the wires when resoldering. Observe that the brush assembly contacts the central portion of the commutator.
7. Perform the following checks and adjustments (described in the section 6, electrical adjustments).

(1) Playback switching point (section 6.4, step 12)
(2) Recording switching point (section 6.4, step 13)
(3) Tracking preset (section 6.4, step 16)
(4) Video head resonance and Q (section 6.5, step1)
(5) P.B. color level (section 6.5, step 2)
(6) Overall checks and adjustments of the signal systems.

5.5.3 Audio/control head subassembly

1. Take out screws Ⓐ, Ⓑ and Ⓒ to remove the A/C head subassembly. Use care regarding the coil springs as shown in Fig. 5-5.
2. Remove the A/C head circuit board. Use care not to damage the wires.
3. Replace the A/C head subassembly and reassemble by reversing the above steps.

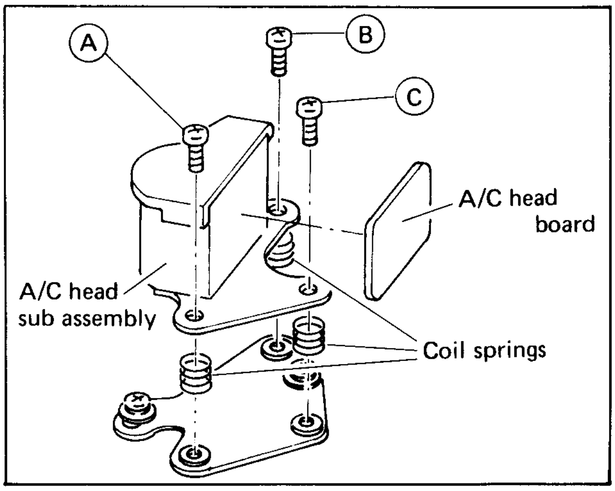


Fig. 5-5 A/C head replacement

4. Perform the following checks and adjustments.

A: Tape transport adjustment

1. Employ cassette tape and set for Play mode.
2. Turn audio/control head screw Ⓒ ((Fig. 5-6) and adjust for smooth transport at the take-up guide pole.
   Do not adjust the height of the take-up guide pole itself.

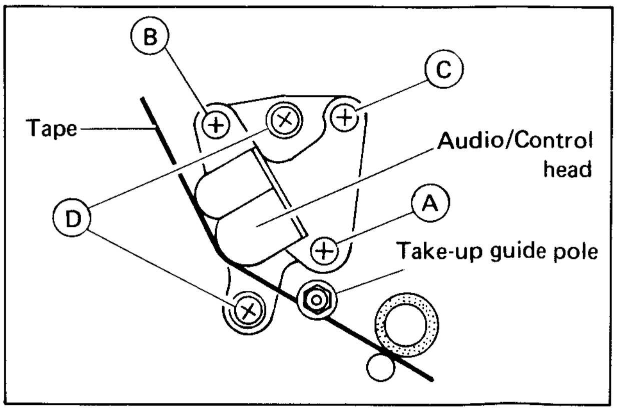


Fig. 5-6 A/C head adjustment-1

B: Audio/control head height and azimuth

1. Connect oscilloscope to Audio TP-2 (Audio out), and play alignment tape (6 kHz and stairstep signals).
2. Turn screws Ⓐ, Ⓑ and Ⓒ (Fig. 5-6) in succession by small and equal increments at a time and adjust for maximum audio output level as shown in Fig. 5-7. With reference to screw Ⓐ, adjust azimuth with screw Ⓑ and adjust screw Ⓒ so that small tape wrinkles at not produced at the guide poles, but at the same time, audio output becomes maximum and level fluctuations minimum. It is suggested to first turn screw Ⓐ by a small amount, then turn screws Ⓑ and Ⓒ by an equal amount and set for maximum output.
3. Carefully and evently adjust screws Ⓐ, Ⓑ and Ⓒ to align the audio/control head height with the tape as shown in Fig. 5-8.

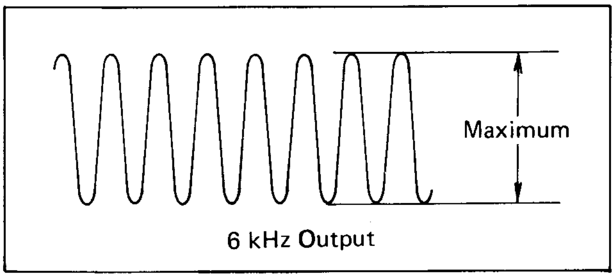


Fig. 5-7 Audio output level

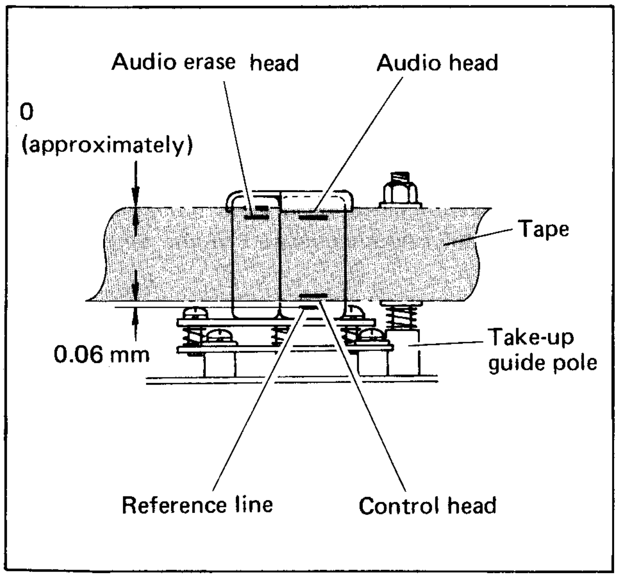

Audio erase head
Audio head
0
(approximately)
Tape
0.06 mm
Take-up guide pole
Reference line
Control head

Fig. 5-8 A/C head adjustment-2

C: Audio/control head inclination

1. Set the height gauge as shown in Fig. 5-9. Check for space t of 0 ± 0.05 mm. If not within this range, adjust according to the above steps.

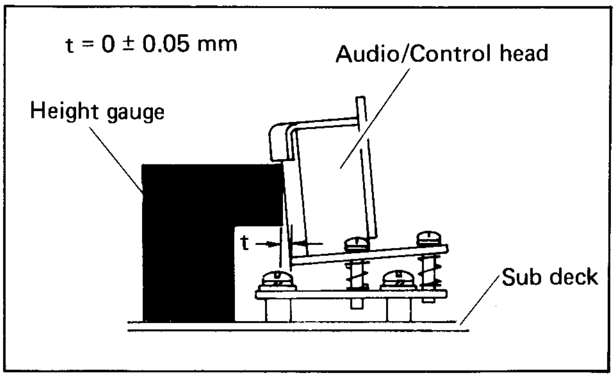

t = 0 ± 0.05 mm
Audio/Control head
Height gauge
t
Sub deck

Fig. 5-9 A/C head inclination

D: Final checks/adjustments

Check according to the following steps.

1. Playback control pulse (see section 6.4, step 11).
2. Control head phase (see section 6.4, step 27).
3. Audio recording and playback levels and the audio circuit (see section 6.7).

5.5.4 Lower drum assembly

1. For considerations of reliability, the drum motor and lower drum assembly should be replaced simultaneously.
2. Disengage the connector from the lower drum assembly (from the bottom side).
3. Remove the Pre/Rec board (see Section 4.2.1) and the upper drum assembly (Section 5.5.2).

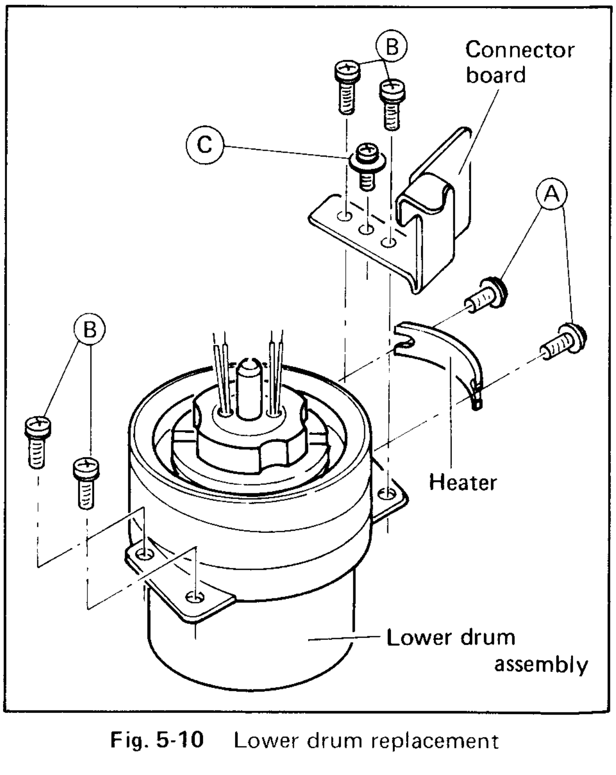

Ⓑ
Connector board
Ⓒ
Ⓐ
Ⓑ
Heater
Lower drum assembly

Fig. 5-10 Lower drum replacement

4. Unsolder the 4 wires from the connector board.
5. Take out screws Ⓐ and remove the heater from the lower drum assembly.
6. Take out screws Ⓑ and screws Ⓒ, remove the board bracket and replace the lower drum assembly.
7. Reassemble by reversing the above steps. Use care to resolder the connector board wires in their proper positions.
8. Perform the following checks and adjustments.
   (1) Drum servo circuit (Section 6.4).
   (2) Interchangeability (Section 5.8).
   (3) The checks and adjustments following upper drum assembly replacement (listed in Step 7 of Section 5.5.2).

5.5.5 Reel motor assembly

1. Before replacing the reel motor assembly, carefully observe its mounting condition (particularly wire polarities, clamping and motor band positioning).
2. Take out screws Ⓐ from the top side and remove the reel motor assembly.

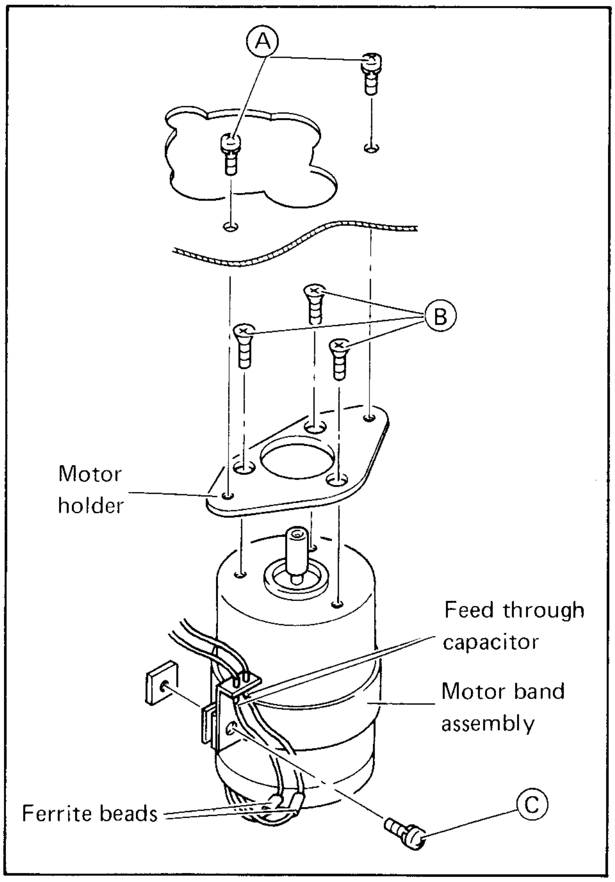


Fig. 5-11 Reel motor replacement

3. Unsolder the motor wires from the feed through capacitor and remove the ferrite beads.
4. Take out screws Ⓑ and remove the motor holder from the reel motor assembly.
5. Loosen screw Ⓒ and remove the motor band assembly, and replace the reel motor assembly.
6. Reassemble by reversing the above steps. To compensate for screw play, mount the motor in the most rearward position, then tighten the screws firmly. Use care regarding the polarity of the motor wires and that the motor band assembly does not contact other parts or the chassis.
7. Perform torque adjustment (section 5.6.6).

5.5.6 Loading motor

1. Before replacing the loading motor, carefully observe its mounting condition (particularly wire polarities, positioning and clamping).
2. Take out screws Ⓐ and remove the loading gear assembly.
3. Unsolder the wires from the motor terminals.
4. Disengage the belt from the pulley, take out screws Ⓑ and remove the loading motor from the loading gear assembly.
5. Loosen the setscrew, remove the motor pulley and replace the loading motor.
6. Reassemble by reversing the above steps. Use a 0.5 mm thickness gauge to mount the motor pulley. Turn the loading rings by hand to end of travel (loading end position) and install the loading gear assembly.
   After completing replacement, turn the loading motor by hand to restore the loading ring positions.

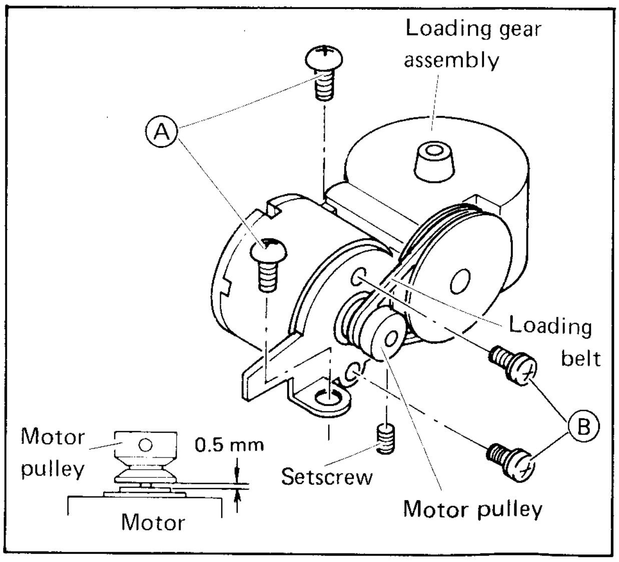


Fig. 5-12 Loading motor replacement

5.5.7 Capstan motor assembly

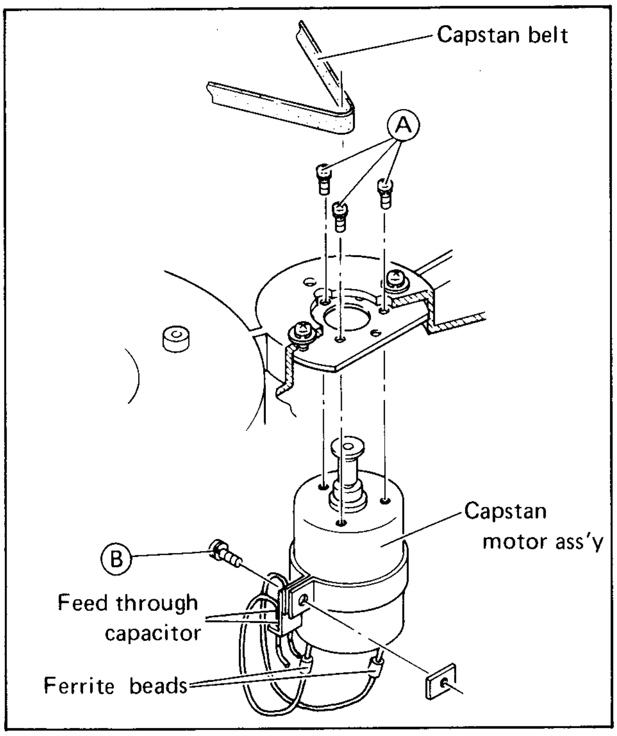

Capstan belt
Ⓐ
Capstan motor ass'y
Ⓑ
Feed through capacitor
Ferrite beads

Fig. 5-13 Capstan motor replacement

1. Before replacing the capstan motor, carefully observe its mounting condition (particularly wire polarities, clamping and motor band positioning).
2. Disengage the belt, take out screws Ⓐ from the bottom side and remove the capstan motor assembly.
3. Unsolder the motor wires from the feed through capacitor and remove the ferrite beads.
4. Loosen screw Ⓑ, remove the motor band assembly and replace the capstan motor assembly.
5. Reassemble by reversing the above steps. Use care that the motor band assembly does not contact other parts or the chassis.
6. Perform capstan servo circuit adjustments (Section 6.4).

5.5.8 Pinch roller solenoid

1. Disengage the connector of pinch solenoid wires from the Audio & CPU board assembly.
2. Unhook spring-1 to free the pinch slide plate.
3. Take out screw Ⓐ and remove the terminal board.

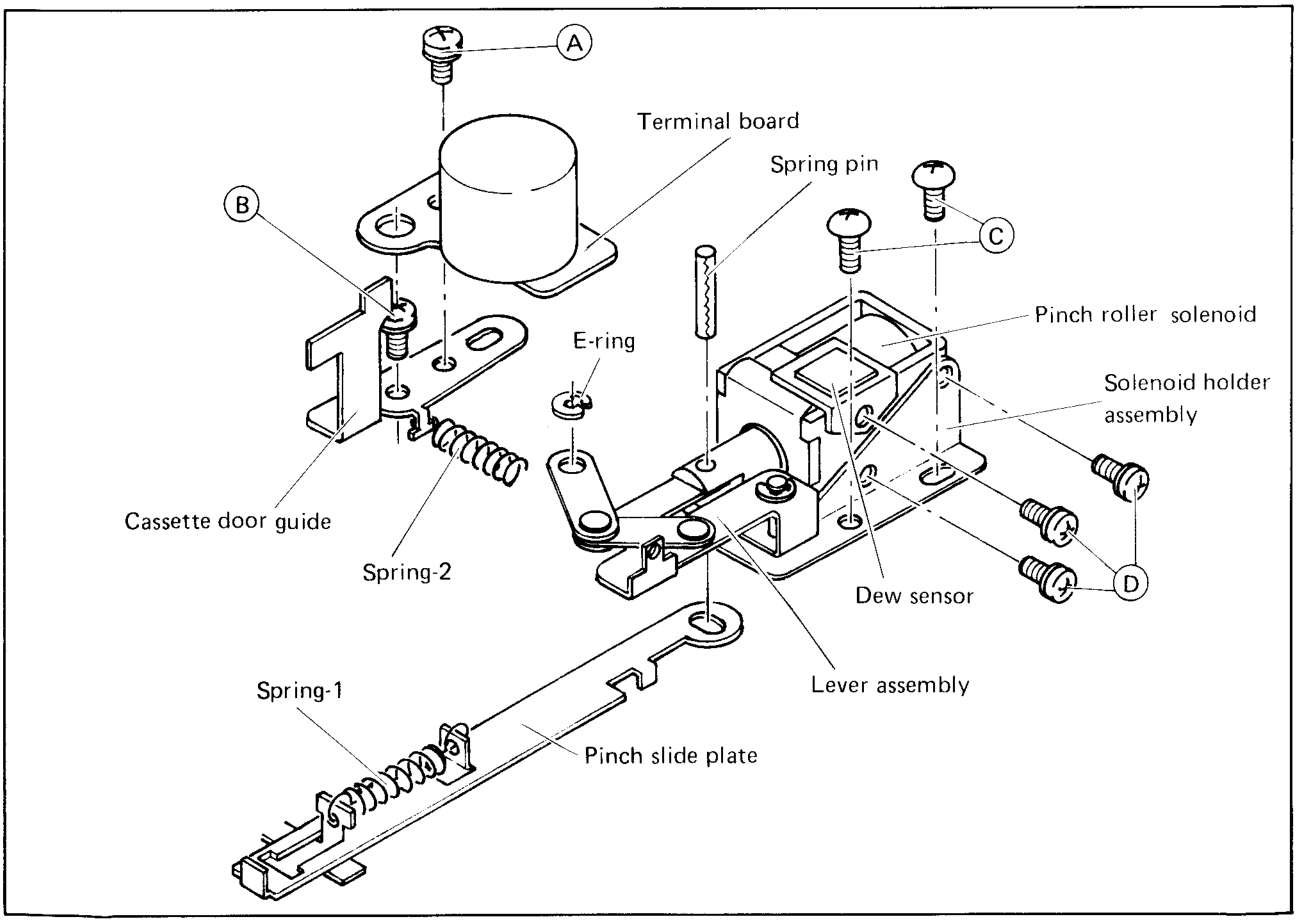

Ⓐ
Terminal board
Spring pin
Ⓒ
Ⓑ
Pinch roller solenoid
E-ring
Solenoid holder assembly
Cassette door guide
Spring-2
Dew sensor
Ⓓ
Lever assembly
Spring-1
Pinch slide plate

Fig. 5-14 Pinch roller solenoid replacement

4. Unhook spring-2 from the lever assembly, take out screw B and remove the cassette door guide.
5. Take off the E-ring, take out screws Ⓒ and remove the pinch roller solenoid assembly.
6. Take out screws Ⓓ, remove the dew sensor and solenoid holder assemblies.
7. Pull out the spring pin from the lever assembly; replace the pinch roller solenoid.
8. Reassemble by reversing the above steps. Mount the solenoid in the forwardmost position, then tighten the screws firmly.

5.5.9 FG (frequency generator) P.W.B.

1. Take out screws Ⓐ and remove the bracket assembly.

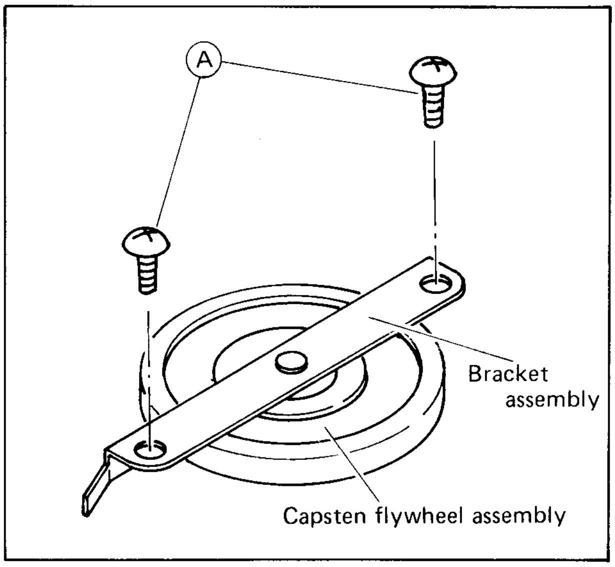


Fig. 5-15 Capstan flywheel replacement

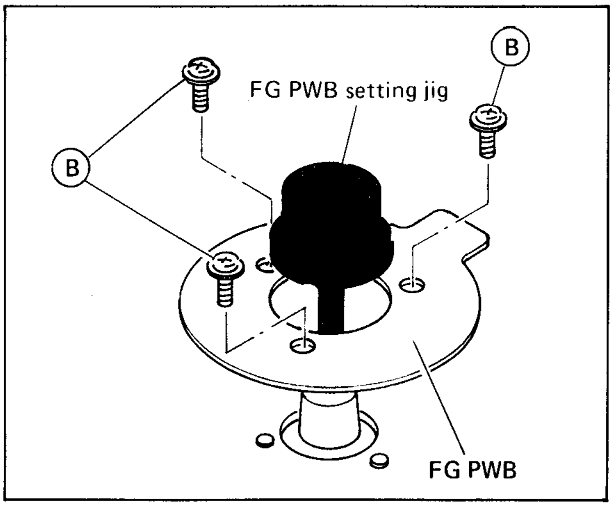


Fig. 5-16 FG P.W.B. setting jig

2. Disengage the belt and remove the capstan flywheel assembly (use care regarding the shield cap).
3. Take out screws Ⓑ, unsolder the wires, and remove the FG P.W.B.
4. Install the new FG P.W.B. by reversing the above steps. Use the FG P.W.B. setting jig to obtain proper positioning. After mounting the capstan flywheel, install the shield cap and clean the capstan shaft thoroughly with alcohol.
5. Confirm capstan FG level (Section 6.4, step 2).

5.6 TAPE TRANSPORT SYSTEM CHECKS AND ADJUSTMENTS

The tape transport system has been precisely aligned at the factory and normally does not require readjustment. The following steps are therefore necessary only in cases of severe usage or when replacing parts affecting the tape transport system.

Before proceeding, remove the cassette housing (see section 5.5.1) and cover the tape start and end sensors with opaque material. Be sure to remove the covers after completing adjustment.

5.6.1 Master plane jig setting

1. Be sure to use the master plane jig part number PUJ42146 for this machine.
2. As shown in Fig. 5-17, position the master plane jig with respect to the reference shaft, pinch roller shaft and the stud.

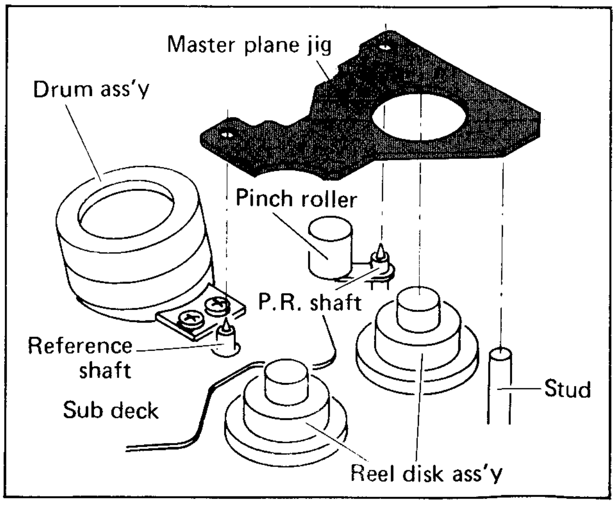


Fig. 5-17 Master plane jig

5.6.2 Reel disk height

1. Set the master plane jig.
2. Use the height gauge (PUJ42147) to check the reel disk assembly height. Measure at 2 places 90° apart. (The earlier reel disk height adjustment jig, Part No. PUJ48014, is not used with this model.)
3. The correct height is between planes A and B, as shown in Fig. 5-19. If it is necessary to adjust the height, add or subtract the required number of height adjusting washers.
4. If replacing the reel disk assembly, apply a small amount of oil to the shaft.

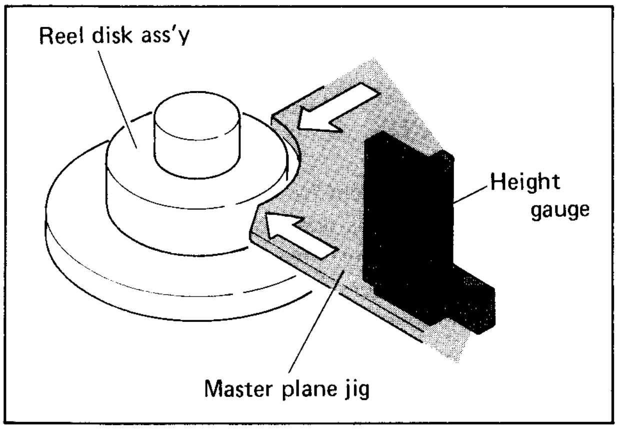

Reel disk ass'y
Height gauge
Master plane jig

Fig. 5-18 Reel disk height adjustment-1

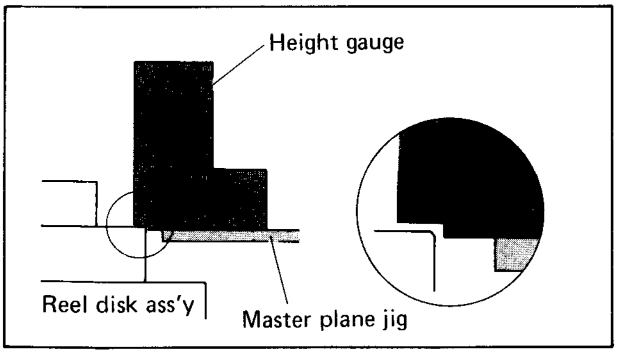

Height gauge
Reel disk ass'y
Master plane jig

Fig. 5-19 Reel disk height adjustment-2

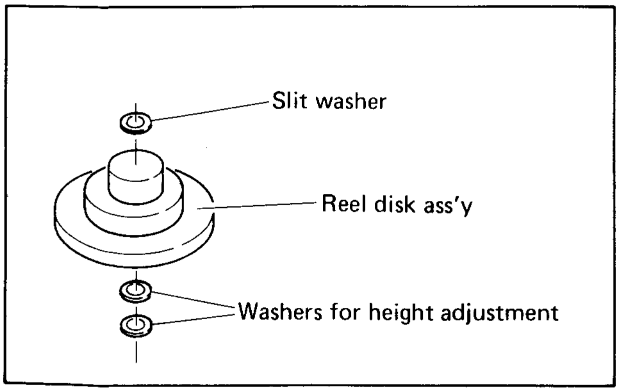

Slit washer
Reel disk ass'y
Washers for height adjustment

Fig. 5-20 Washers for height adjustment

5.6.3 Guide poles and full erase head

1. Set the height gauge (PUJ42147) on the sub deck and check the perpendicularity.
2. For each guide pole, check the height of the lower face of the upper flange. If necessary, carefully adjust by turning the nut.
3. If guide pole height has been adjusted, tape transport operation checks are required (see section 5.7).

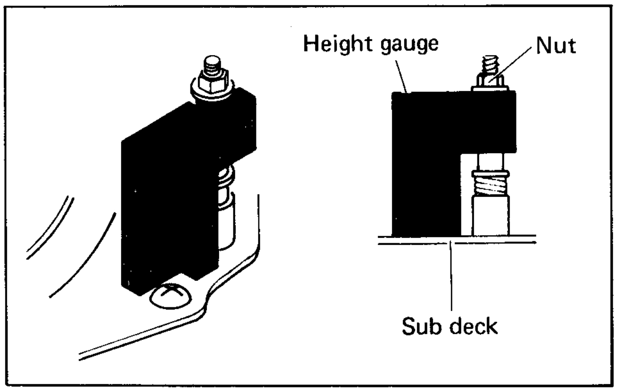

Height gauge
Nut
Sub deck

Fig. 5-21 Guide pole height adjustment

5.6.4 Pinch roller

1. Set the master plane jig and use the height gauge.
2. Supply power and set for the Play mode. After the pinch roller contacts the capstan shaft, check for parallel between planes a – a' of the height gauge and c – c' of the pinch roller with respect to the tape running direction. If necessary, adjust by bending the pinch roller arm assembly.
3. While in the Play mode, cut off the power to separate the pinch roller from the capstan shaft.
4. Check for parallel between planes b – b' of the capstan shaft and c – c' of the pinch roller with respect to the pinch roller pressing direction. If required, adjust by bending the pinch roller arm assembly.

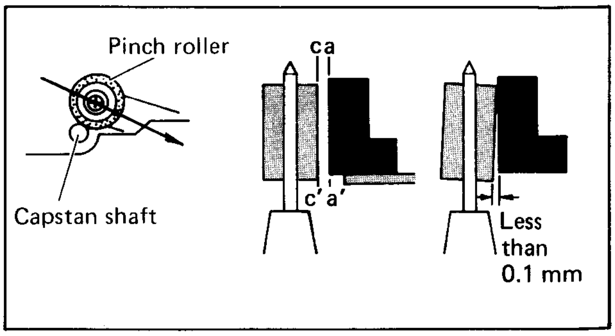

Pinch roller
ca
Capstan shaft
c' a'
Less than 0.1 mm

Fig. 5-22 Pinch roller parallel-1

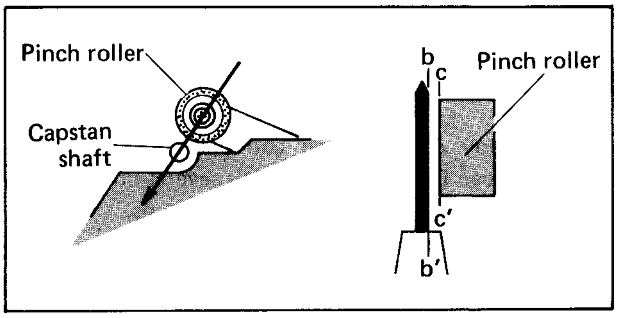

Pinch roller
Capstan shaft
b
c
Pinch roller
c'
b'

Fig. 5-23 Pinch roller parallel-2

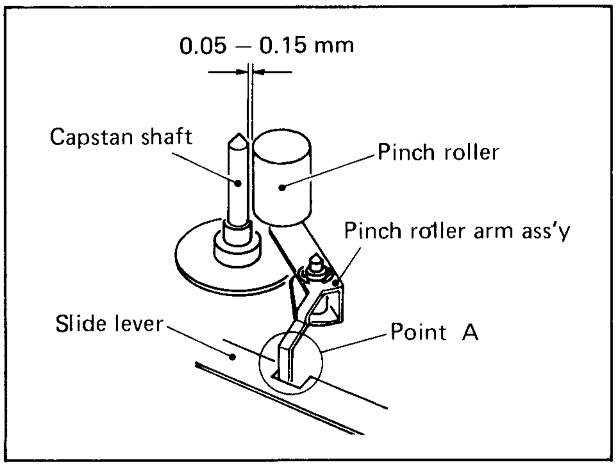

0.05 – 0.15 mm
Capstan shaft
Pinch roller
Pinch roller arm ass'y
Slide lever
Point A

Fig. 5-24 Pinch roller spacing

5. Check for 0.05 to 0.15 mm spacing between the pinch roller and capstan shaft. If necessary, adjust by bending point A of the pinch roller arm as shown in Fig. 5-24.
6. Supply power and return to the Stop mode.

5.6.5 Tension pole position and back tension

1. Set the height gauge on the sub-deck and check the perpendicularity of the tension pole.
2. At the beginning portion of 120 minute tape, set for the Play mode.
3. Check for the relationship shown in Fig. 5-25 between tension pole center and the sub-deck cutout. If necessary, loosen screw Ⓐ and adjust the bracket position.
4. Use the back tension cassette gauge and set for the Play mode.
5. Check that back tension is 23 ± 5 g-cm. If necessary, loosen screw Ⓑ (this requires removing the SERVO board) and turn screw Ⓒ to adjust the spring hook position.
6. Again check the tension pole position.

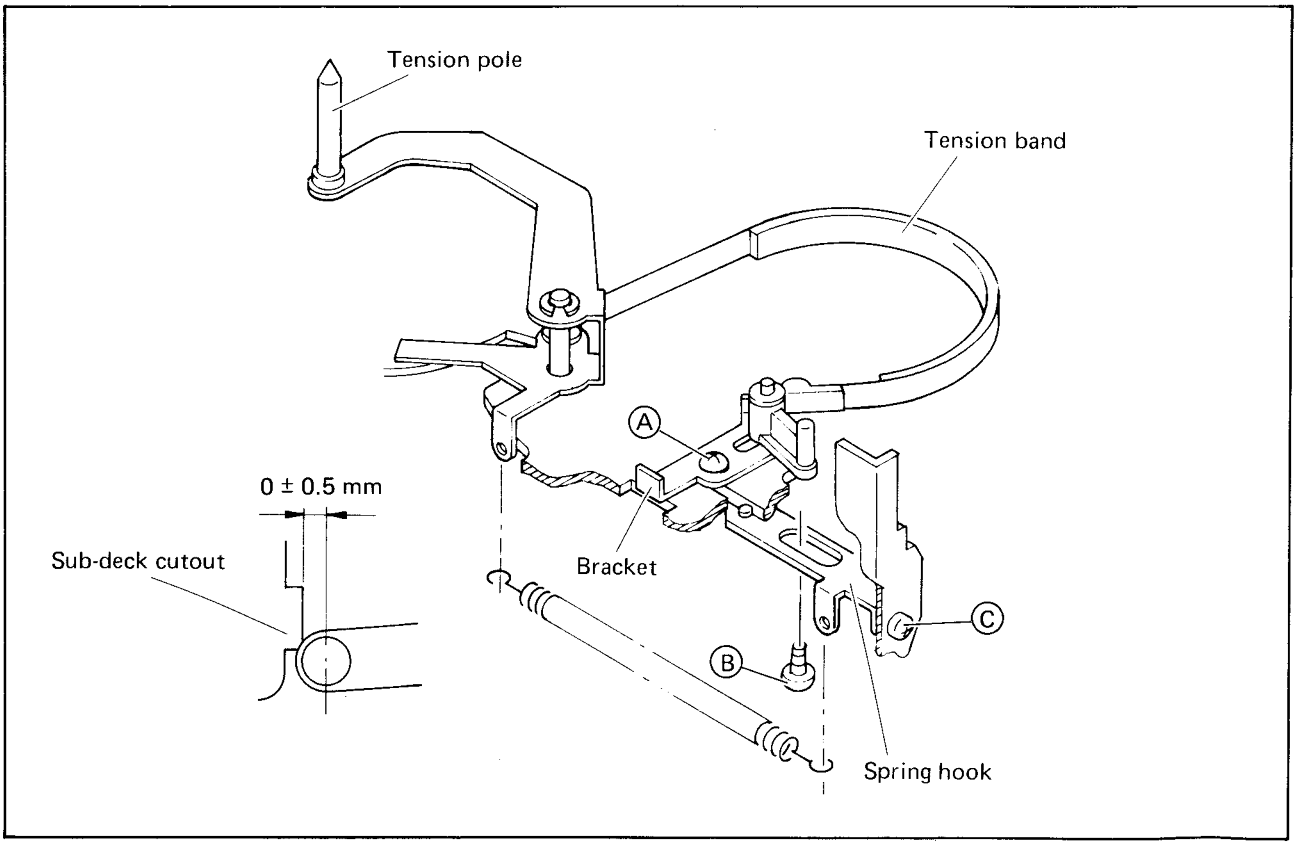

Tension pole
Tension band
Ⓐ
0 ± 0.5 mm
Sub-deck cutout
Bracket
Ⓒ
Ⓑ
Spring hook

Fig. 5-25 Back tension mechanism

5.6.6 Torque (take-up, unloading, FF/REW)

The earlier torque gauge head (Part No. PUJ48016) cannot be used with this model. Be sure to employ the Part No. PUJ48016-2 for the following steps.

Note: It is suggested to extend the SERVO board by using the patch cord (Part No. PUJ42164A), since this would allow both adjustments and checks.

1. Apply the torque gauge to the take-up reel disk and set for the Play mode.
2. Grasp the torque gauge loosely and gradually turn it so that the scale and needle move simultaneously, then read the indication.
3. Check for take-up torque between 60 and 120 g-cm. If necessary, adjust R135 (PLAY) of the SERVO board to obtain 80 g-cm. At this time, terminal 102 is approx. 2.3 VDC.

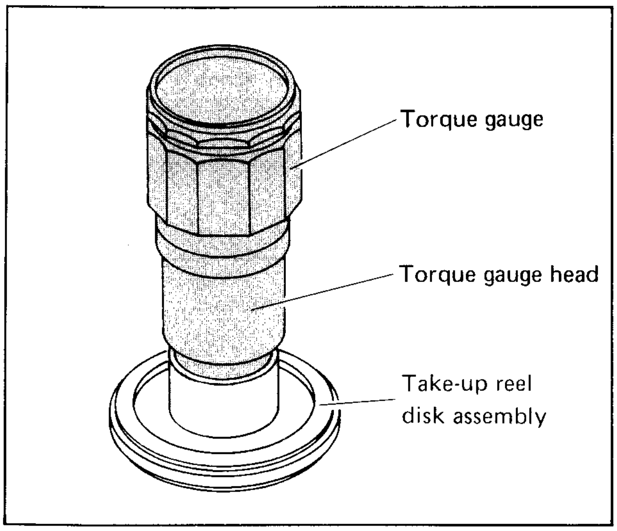


Fig. 5-26 Take-up torque

4. Connect digital voltmeter to terminal 103 of the SERVO board.
5. Adjust R136 (UL) of the SERVO board to obtain 2.5 VDC during the unloading mode.
6. Connect digital voltmeter to terminal 102 of the SERVO board and set for the FF mode without a cassette tape.
7. Adjust R138 (FF/REW) of the SERVO board to obtain 9.0 VDC.
8. Check that the 120 minute tape becomes wound completely within 5 minutes.

5.7 TAPE TRANSPORT OPERATION

5.7.1 Tape transport check

1. Employ cassette tape and operate the machine between Play and Stop modes several times.
   Check according to the following steps.
2. During Play mode, observe tape at the input and output portions (A and B in Fig. 5-27) of the head drum lead.
   Confirm that the tape slips neither upward nor downward with respect to the lead as shown in Fig. 5-28.

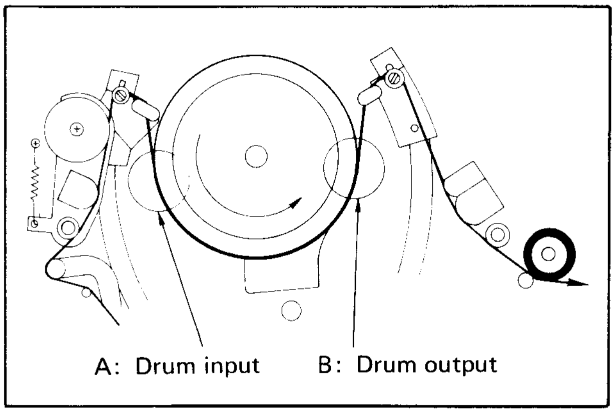


Fig. 5-27 Tape transport check

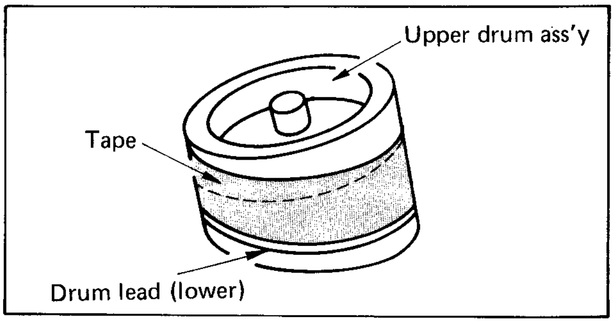


Fig. 5-28 Drum lead check-1

NOTES:

1. Slips upward : sound becomes produced by contact between tips of rotating heads and edge of tape.
2. Slips downward : tape curls or wrinkles from contacting lead face (sound may also be produced).
3. During loading, Play and unloading, observe the tape at the supply and take-up guide rollers and guide poles.
   Confirm absence of curling, wrinkling, etc as shown in Fig. 5-29.

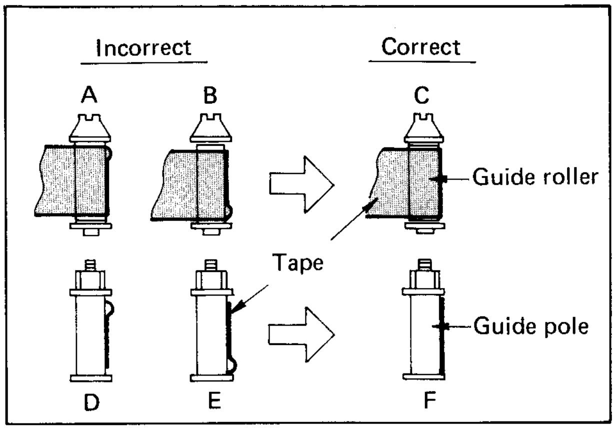

Incorrect
Correct
A
B
C
Guide roller
Tape
Guide pole
D
E
F

Fig. 5-29 Guide roller and Guide pole

4. Observe the tape as it becomes wrapped around drum during loading and as it separates from the drum during unloading.
   Confirm absence of damage to the tape at points C and D as shown in Fig. 5-30 and absence of contact noise between head tips and tape edge.

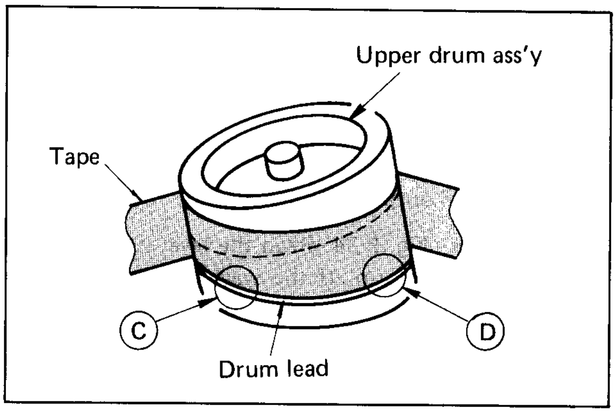

Upper drum ass'y
Tape
C
D
Drum lead

Fig. 5-30 Drum lead check-2

5.7.2 Tape transport adjustments

Perform only if defects are noted during tape transport check (5.7.1).

A: Guide roller height

1. Slightly loosen setscrews of the supply and take-up guide rollers as shown in Fig. 5-31.
2. Use cassette tape and set for Play mode.
3. With a slotted screwdriver, slightly turn the supply guide roller (do not turn more than 180° at a time) and adjust so that at the drum input, the tape travels smoothly in the drum lead without slipping upwards or downwards.
4. Similarly, adjust the take-up guide roller for the drum output.

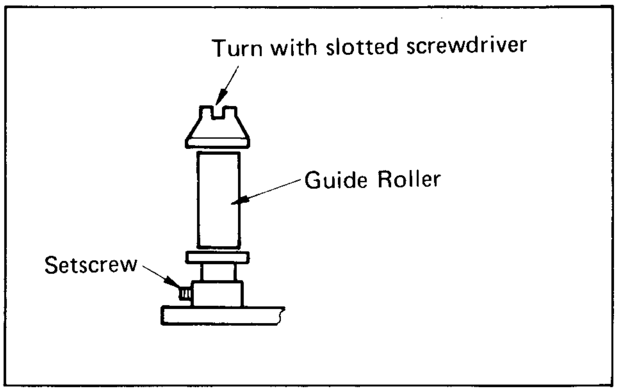

Turn with slotted screwdriver
Guide Roller
Setscrew

Fig. 5-31 Guide roller height

NOTES:

1. Loosen the setscrews only enough to allow the guide rollers to be turned.
   If excessively loose, tape motion may turn the rollers inadvertently.
2. Turn the rollers carefully to avoid damage to the tape.

B: Supply guide pole height

1. Use cassette tape and set for Play mode.
2. Use a nutdriver to turn the supply guide pole to align the upper flange of the guide pole with the upper edge of the tape as shown by F of Fig. 5-29. However, this adjustment must be performed so that at the same time, the upper flange remains within ±0.5 mm of the height adjusting jig portion shown in Fig. 5-21.
   If there is a large discrepancy, check the height of the supply reel disk, tension pole and other mechanical components.

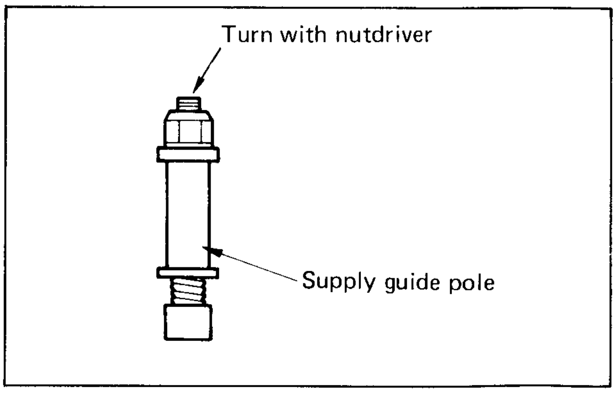

Turn with nutdriver
Supply guide pole

Fig. 5-32 Supply guide pole height

C: Take up guide pole

NOTE: Do not adjust the height of the take-up guide pole itself.

1. Employ cassette tape and set for Play mode.
2. Turn audio/control head screw Ⓒ as shown in Fig. 5-33 and adjust for smooth transport at the take-up guide pole as shown by F of Fig. 5-29.

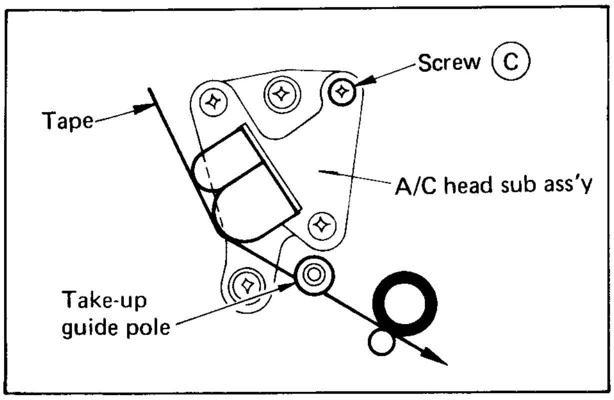


Fig. 5-33 Take-up guide pole

5.8 INTERCHANGEABILITY ADJUSTMENT

Before using alignment tape, employ cassette tape and confirm correct tape transport.

5.8.1 Preliminary checks

A: Check sequence 1

1. Connect oscilloscope to PRE/REC TP-5 (FM OUT).
   At this time, trigger the oscilloscope externally with the signal (30 Hz square wave) from SERVO TP-2 (F.F.) and set oscilloscope sync slope to minus (−).

NOTE:

The track widths of both heads are wider than those of standard models, while the CH-2 track width is wider than CH-1.
Therefore when checking FM output, observe the CH-1 FM output only.

2. Play stairstep portion of the alignment tape.
3. Turn the Normal tracking control and adjust for maximum FM output at PRE/REC TP-5.
   Set the Normal Tracking control to AUTO (center click position) and confirm that nearly maximum output is obtained.
4. Refer to Fig. 5-34. Read the level of portion (a) of the waveform. If the waveform is serrated at point (a), read the value at the most uniform serrations as shown at left in Fig. 5-34.
5. As shown by the broken lines, read the FM waveform value at point (b) and confirm that:
   $\frac{b}{a} \geqq 0.7$ or $20 \log \frac{b}{a} \geqq -3$ dB
6. Read the values at points (c) and (d) [drum input and output] and confirm that:
   $\frac{c}{a} \geqq 0.5$ and $\frac{d}{a} \geqq 0.5$ ($\geqq -6$ dB)

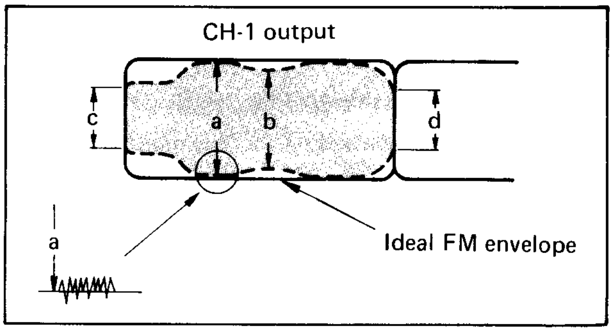


Fig. 5-34 CH-1 FM waveform (max. output)

NOTES:

1. Read minimum levels for (b), (c) and (d).
2. If above checks yield normal results, proceed to section 5.8.1-B.
3. If defects are noted, perform adjustments of section 5.8.2.

B: Check sequence 2

1. Observe the FM waveform as in the previous section (5.8.1-A) and turn the Normal Tracking control.
   The waveform variation should be nearly parallel as shown in Fig. 5-36.
2. If the waveform varies as shown in Fig. 5-35, adjustment becomes required.

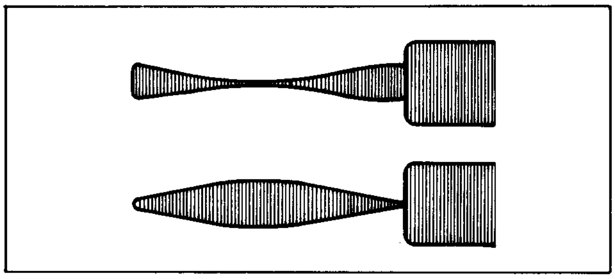


Fig. 5-35 Incorrect waveform examples

5.8.2 Preliminary adjustments

1. Loosen the setscrews of the supply guide roller and take-up guide roller.
   If the guide rollers turn freely, slightly tighten the setscrews.
2. Without the cassette housing ass'y, open cassette cover and insert cassette.
   At this time, place a weight on the cassette to hold the cassette in place.
3. Connect oscilloscope to PRE/REC TP-5 (FM OUT).
   Trigger the oscilloscope externally with the signal from SERVO TP-2(F.F.) and set oscilloscope sync slope to minus (−).
4. Play alignment tape (stairstep signal).

A: Drum input

1. Observe oscilloscope display and adjust the Normal Tracking control for maximum FM output.
2. Refer to Fig. 5-37. Examples of incorrect waveforms are shown by A.
   Use a slotted screwdriver to adjust the supply guide roller so that the rising portion (drum input portion) of the waveform becomes flat as shown by B.

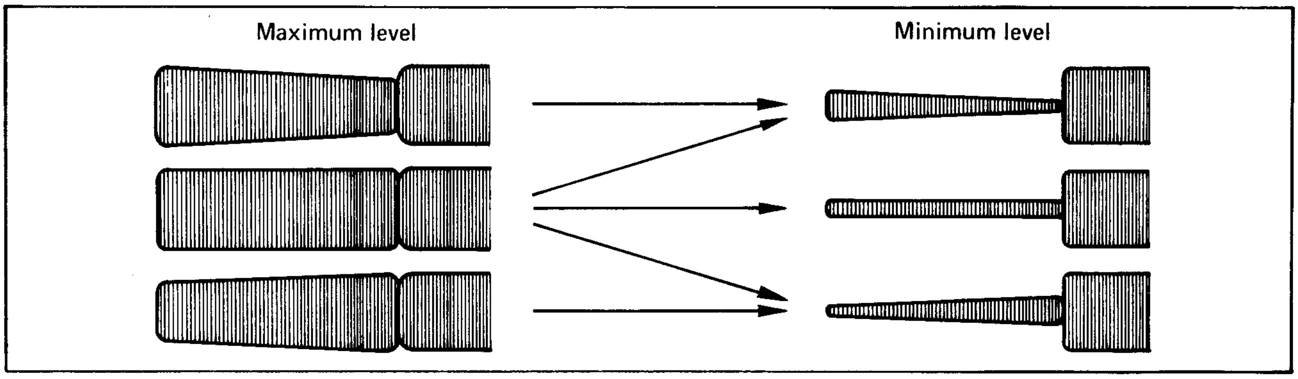


Fig. 5-36 Normal waveform examples

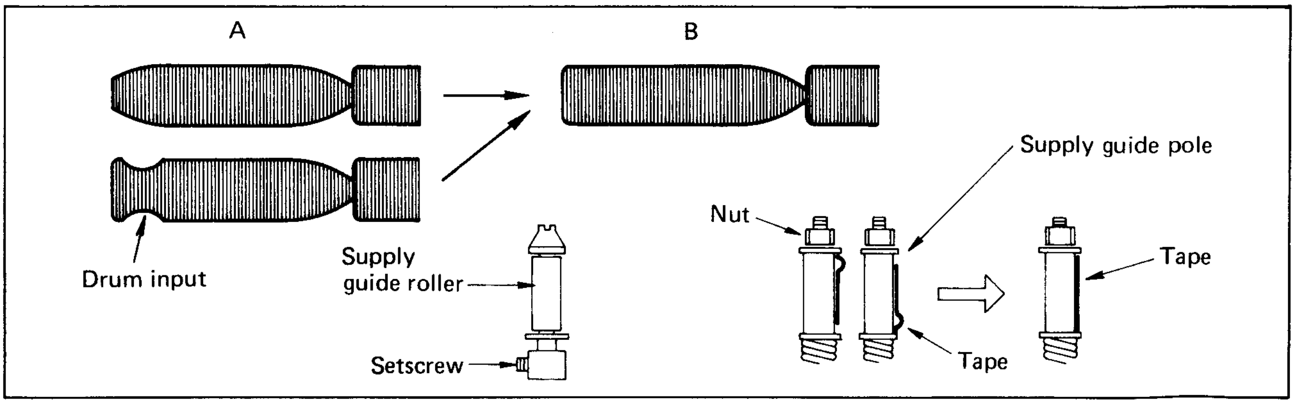


Fig. 5-37 Drum input adjustments

NOTES:

1. If the guide roller turns freely, tighten the setscrew slightly.
2. Be sure to adjust the guide roller only by small amounts at a time in order to avoid damaging the alignment tape.
   In addition to observing the waveform, confirm absence of tape slippage or curling at the drum lead and guide poles.
3. At the supply guide pole, if the tape separates from the guide or wrinking occurs, adjust the guide pole height.
   Align the upper flange of the guide pole with the tape as shown in Fig. 5-37.

B: Drum output

1. In the same manner as for the drum input, turn the take-up guide roller to adjust the falling portion (drum output portion) of the FM waveform.
   Incorrect examples are shown by C in Fig. 5-39, while D indicates the correct adjustment.
2. If the tape separates from the guide or wrinkling occurs at the take-up guide pole, adjust by turning screw Ⓒ of the audio/control head as shown in Fig. 5-39.

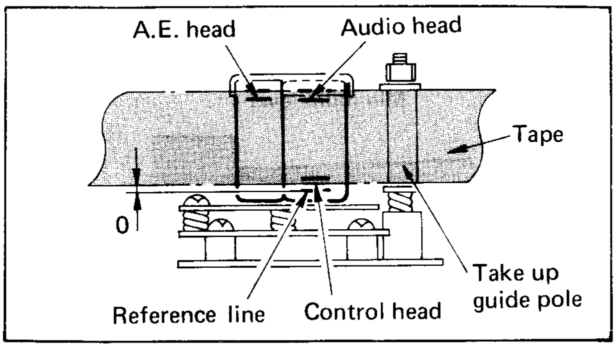


Fig. 5-38 Audio/control head height

3. Carefully and evenly adjust screws Ⓐ, Ⓑ and Ⓒ to align the audio/control head height with the tape as shown in Fig. 5-38.

NOTES:

1. Fine adjustment is not required at this time. It is sufficient that the tape is engaged with the guide pole and servo operates stably (control signal picked up).
2. If the tape separates from the take-up guide pole or wrinkling occurs, screw Ⓒ (Fig. 5-39) has been turned excessively with respect to screws Ⓐ and Ⓑ, causing the audio/control head to incline forward or rearward. Use care to adjust screws Ⓐ, Ⓑ and Ⓒ evenly and observe that small wrinkles are not produced at the take up guide pole.
3. Do not disturb the take-up guide pole.

5.8.3 Interchangeability fine adjustment

1. Connect oscilloscope to PRE/REC TP-5 (FM OUT).

   Observe the CH-1 FM waveform and adjust the Normal Tracking control for minimum FM output level.
2. If the waveform becomes as shown by A or B of Fig. 5-40, carefully adjust the supply guide roller height so that the waveform becomes as shown by E, F or G of Fig. 5-41.
   At this time, if the waveform fluctuates, adjust to the point of minimum fluctuation.
3. If the FM waveform appears as shown by C and D in Fig. 5-40, carefully adjust the take-up guide roller height to obtain a waveform such as shown by E, F or G of Fig. 5-41.
   At this time, if the waveform fluctuates, adjust to the point minimum fluctuation.

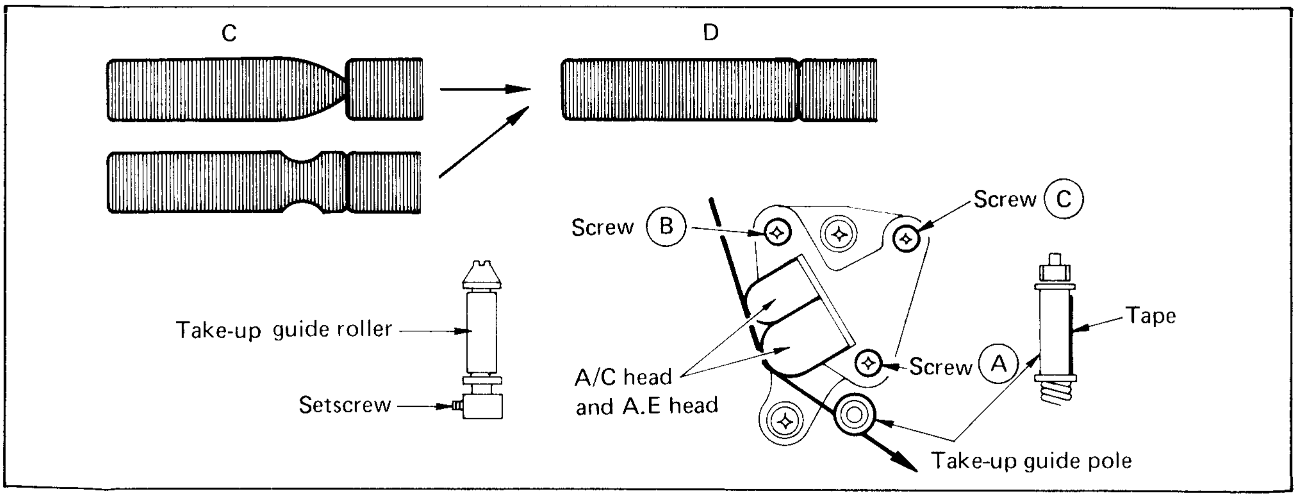


Fig. 5-39 Drum output adjustment

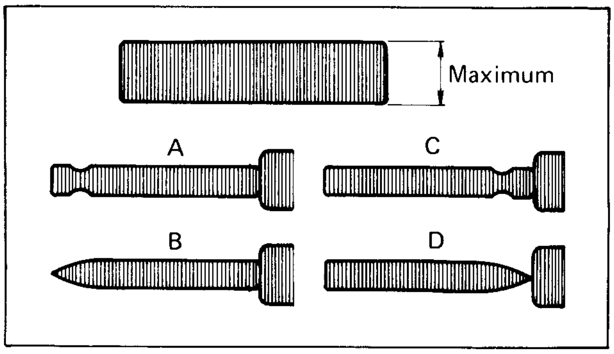


Fig. 5-40 Minimum FM output (incrorrect examples)

4. Vary the Normal Tracking control from maximum to minimum FM output.
   Perform fine adjustment of supply and take-up guide rollers so that waveform variation becomes as shown by E, F and G of Fig. 5-41.

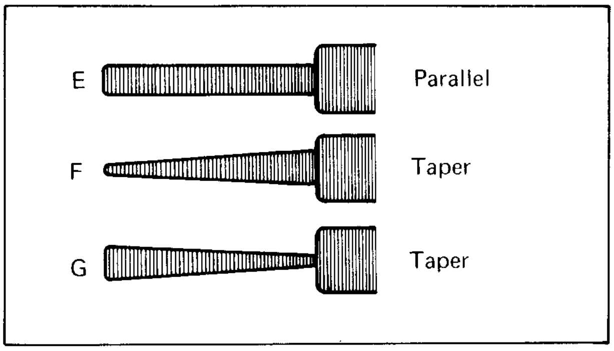


Fig. 5-41 Minimum FM output (correct examples)

5.8.4 Audio/control head height, azimuth and inclination

See section 5.5.3 Audio/control head.

5.8.5 Setscrew tightening

1. Check for maximum FM output waveform (Fig. 5-40), maximum audio out (Fig. 5-7) and absence of tape wrinkling or other transport irregularities, then secure the guide rollers.
   Perform in stop mode.
2. Since the guide rollers are easily moved, use care when securing.
3. After tightening the setscrews, again perform interchangeability final checks.

5.8.6 Interchangeability final checks

Confirm section 5.8.1 Preliminary checks.

5.8.7 Servo circuit adjustment

1. Playback switching point (see section 6.4, step 12)
2. Recording switching point (see section 6.4, step 13)
3. Tracking preset (see section 6.4, step 16)
4. Control head phase (see section 6.4, step 27)

5.8.8 Final checks (recording and playback)

1. Use cassette tape and perform recording and playback.
   Confirm FM waveform and specifications equivalent to those during playback of alignment tape (stairstep signal).
   See section 5.8.1.
2. Perform checks and adjustments of the audio recording and playback levels and the audio circuit.
3. Check other signal systems by referring to section 6, electrical adjustment.

SECTION 6
ELECTRICAL ADJUSTMENTS

6.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts. It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

6.1.1 Required test equipment

1. Digital voltmeter: HEWLETT-PACKARD Model 3476A/B or equivalent
2. Oscilloscope: Wide-band, Dual-trace
3. Signal generator: Color bar, Stairstep
4. Frequency counter: HEWLETT-PACKARD Model 5381A or equivalent
5. Regulated DC power supply
6. Audio generator
7. Alignment tape: JVC MH-2

NOTE: Be sure to first check for smooth and proper tape transport before using the alignment tape.

6.1.2 JVC alignment tape contents

Segment	Playback Time	Video Signal	Audio Signal	Applications
1	10 minutes	Stairstep	6 kHz	● Interchangeability checks and adjustments ● Servo circuit checks and adjustments ● Audio head azimuth adjustments Note: Set the TRACKING control to the center (click) position.
2	5 minutes	(none)	3 kHz	● Tape speed checks ● Wow and flutter checks
3	10 minutes	Color bar	1 kHz	● Video signal playback circuit checks and adjustments ● Audio signal playback circuit checks and adjustments Note: Set the TRACKING control to MANUAL and adjust for maximum FM output level at TP-5 (PB FM OUT) of the PRE/REC board.
4	3 minutes	RF sweep	(none)	● Video head resonance adjustments Marker: 5.0 MHz

Table 6-1 MH-2 contents

6.1.3 Check and Adjustment steps

The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No.	Checks and adjustments are numbered in the recommended sequence in which they are to be performed.
Item	Name assigned to the particular check and adjustment step.
Check Point	Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.
Adjustment Parts	Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (—) indicates check only.
Signal	Input signal required to perform adjustment. Dash (—) indicates that special signal is not required.
Color bar	Color bar signal as video input
Stairstep	Stairstep signal as video input
1 kHz	Supply a 1 kHz sinewave as audio input signal
MH-2 Color bar	Play color bar segment of JVC MH-2 alignment tape

MH-2 Stairstep	Play stairstep segment of JVC MH-2
MH-2 3 kHz	Play 3 kHz audio signal segment of JVC MH-2 alignment tape.
MH-2 1 kHz	Play 1 kHz audio signal segment of JVC MH-2 alignment tape.
MH-2 RF sweep	Play RF sweep segment of JVC MH-2
Mode	Equipment operating mode at time of check or adjustment.
STOP	Power on and machine in Stop mode
REC	Recording mode
P.B.	Play mode
REC → (another mode)	Use blank tape, record, then play back in the mode specified.
SLOW	Slow motion playback
STILL	Still mode playback
SEARCH	Shuttle Search (S-FWD and S-REV) playback mode
AUDIO DUB	Audio dubbing mode
Description and Waveform	This column provides an explanation of the step, notes, adjustment values and waveform diagrams.

6.2 REGULATOR CIRCUIT AND PRELIMINARY CHECK

No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description & Waveform
1	9 V REG.	TP-15 Chroma	–	–	STOP	Vary DC power supply voltage for a range of from 11 V to 15 V at TP-14 of Chroma board. Confirm TP-15 voltage of 9 ± 0.2 V DC.
2	Battery Power Indicator	TP-14 Chroma IC5-1 Mechacon Battery Power Indicator	R45 (B-ST) Mechacon R48 (B-AL) Mechacon	–	STOP	1. Adjust DC power supply for 10.5 V at TP-14. 2. Rotate R45 fully counterclockwise, then turn it clockwise gradually until DC voltage at pin 1 of IC5 on Mechacon board becomes high. 3. Adjust the DC power supply for 11.0 V at TP-14. 4. Rotate R48 fully clockwise, then turn it counterclockwise gradually until the battery power warning indicator lights.
3	Dew Indicator	Dew Indicator	R56 Mechacon	–	STOP	When a 10 kΩ resistor is temporarily added in parallel with R56, Dew indicator should light.

6.3 MECHANISM CONTROL CIRCUIT

6.3.1 Power on state

1) STOP LED lights.
2) The Stop mode is produced.
3) If tape is loaded, unloading is performed, then the Stop mode produced.

6.3.2 Mode priorities

1) Button operations are shown in the Mode shift table (Table 6-2). Generally, a desired mode can be selected directly from a mode in progress.
2) If two or more buttons are pressed simultaneously, the following priority applies: STOP – REC – DUB – PLAY – FF – REW – PAUSE/STILL.

Current mode \ Button operation	STOP	PLAY	F.F.	REW	PLAY +REC	PLAY +DUB	P/S +REC	P/S +DUB	FWD	REV	PAUSE /STILL	SLOW	FRAME ADV
STOP		O	O	O	O	O	O	O	X	X	X	X	X
PLAY	O		O	O	O	O	O	O	O	O	O STILL	O	X
F.F.	O	O		O	O	O	O	O	X	X	X	X	X
REW	O	O	O		O	O	O	O	X	X	X	X	X
REC	O	X	X	X		X	O	X	X	X	O REC PAUSE	X	X
DUB	O	X	X	X	O		O	O	X	X	O DUB PAUSE	X	X
REC PAUSE	O	O REC	X	X	O	X		O	X	X		X	X
DUB PAUSE	O	O DUB	X	X	O	O	O		X	X		X	X
FWD	O	O	O	O	O	O	O	O		X	O STILL latch	O SLOW latch	X
REV	O	O	O	O	O	O	O	O	O		O STILL latch	O SLOW latch	X
STILL	O	O	O	O	O	O	O	O	O	O		O	O
SLOW	O	O	O	O	O	O	O	O	O	O	O		X

O : Enabled X : Inhibited (Current mode maintained)

Table 6-2 Mode shift table

3) Shuttle search forward and reverse are enabled only during the Play, Still and Slow modes. These are performed while the S-FWD or S-REV button is held depressed.

4) Simultaneously pressing the S-FWD and S-REV buttons yields the Play mode.

5) The following combined button operations are enabled: REC + PLAY; REC + PAUSE/STILL; AUDIO DUB + PLAY; AUDIO DUB + PAUSE/STILL.

6.3.3 Stop mode entry

1) The Stop mode is entered automatically at tape end and tape start.

2) When the power supply voltage declines to 10.8 V, the BATT indicator lights. At 10.5 V, the Stop mode is automatically entered.

3) In event of moisture condensation, the DEW indicator lights and the Stop mode is entered. In this and the above cases, button operations are inhibited until normal conditions return.

4) During the COUNTER MEMORY mode, when the indication reaches 0 in FF and REW.

5) In the FF or REW mode, when the take-up reel stops for more than 4 to 6 seconds, the Stop mode is obtained (due to stop output from counter).

6.3.4 Alarm mode

In the following situations, the Stop mode is automatically set and the mode indicators flash sequentially from left to right. After correcting the difficulty, briefly set the power to off, then to on in order to enable mode operations.

1) If the brake and pinch switches are not operated on/off within approx. 2.5 seconds after the brake (main) and pinch solenoid commands are sent from the CPU.

2) Drum rotation stopped; absence of the drum flip-flop signal for 4 to 6 seconds in a mode when the head drum is supposed to rotate.

3) Take-up reel stops for 2 to 4 seconds in the Play, Recording or Audio Dub mode.

4) Cassette lamp failure.

5) Loading or unloading mode does not complete within about 6 seconds after starting.

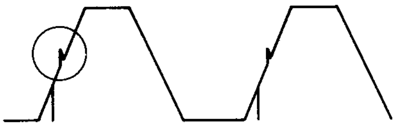
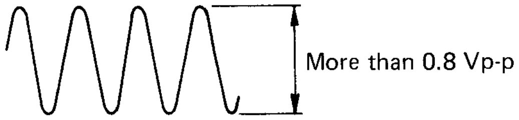
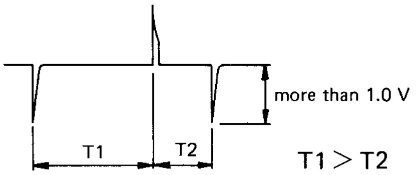
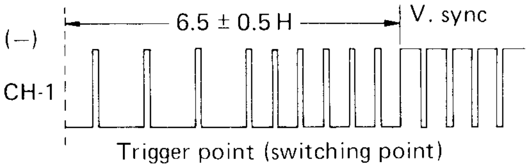
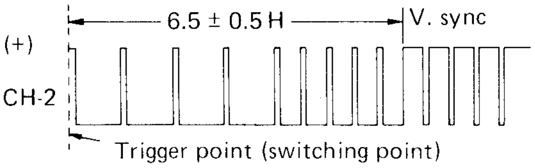
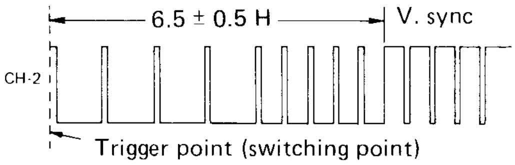
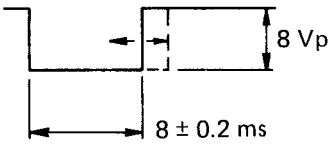
6.3.5 Recording (REC) lock switch

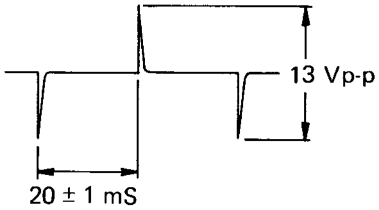
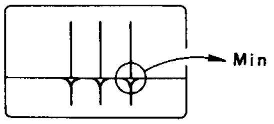
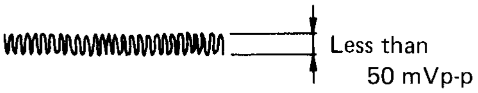
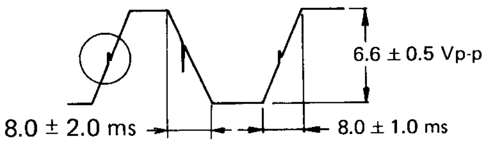
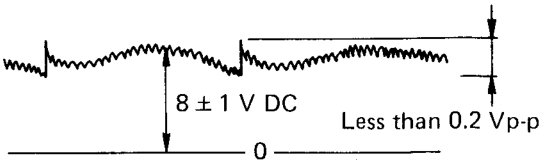
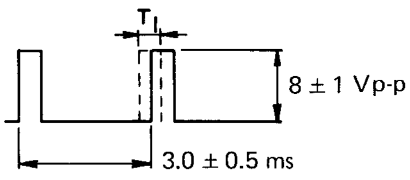
1) After power on, if the REC lock switch is pressed within about 2 seconds, the Recording mode is obtained.

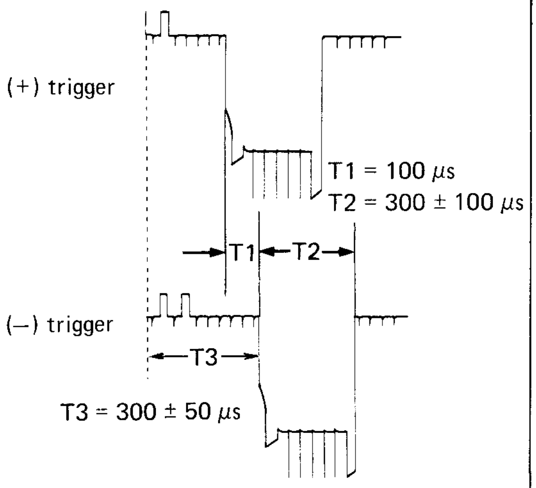
2) If another operating button is pressed during this 2 seconds, REC lock is disregarded and the selected mode becomes entered.

3) REC lock operation is enabled in both loading and unloading modes.

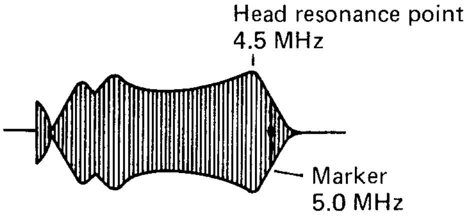
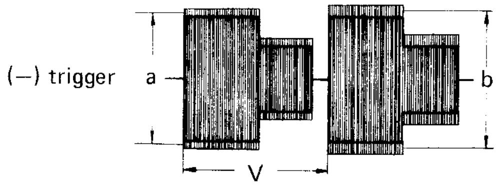
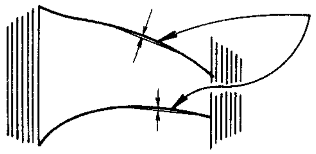
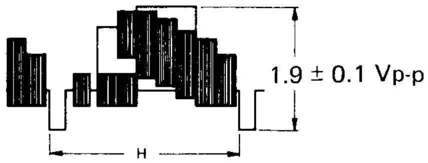
4) REC lock is inhibited at tape end.

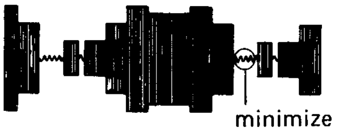
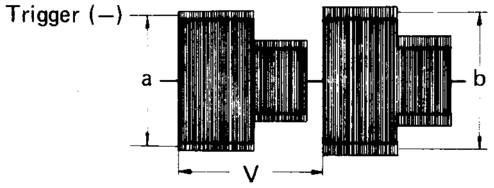
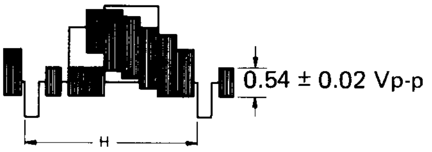
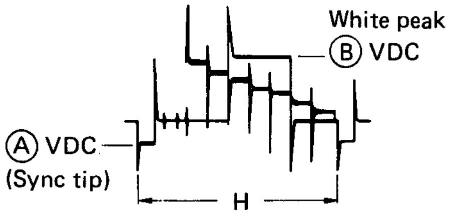
No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
9	Drum Free-run	TP-4	R47 (D. F.R.)	Color Bar	REC	Short circuit TP-6 and TP-26. Adjust R47 for minimum sampling pulse drift. 
10	Drum F.G.	TP-7	–	Color Bar	REC	 More than 0.8 Vp-p f ≒ 1.5 kHz Level fluctuation less than 1 dB
11	P.B. Control Pulse	TP-11	–	MH-2 Color Bar	P.B.	 more than 1.0 V T1 T2 T1 > T2
				Color Bar	REC ↓ P.B.	
12	P.B. Switching Point	TP-1	R16 (CH-1 SW Phase)	MH-2 Stairstep	P.B.	Trigger oscilloscope externally from TP-2 and set trigger slope to "–".  6.5 ± 0.5 H V. sync (–) CH-1 Trigger point (switching point)
			R15 (CH-2 SW Phase)	MH-2 Stairstep	P.B.	Set trigger slope to "+".  6.5 ± 0.5 H V. sync (+) CH-2 Trigger point (switching point) Confirm a difference between CH-1 and CH-2 of within 1H.
13	REC Switching Point	TP-1	R4 (REC SW)	Color Bar	REC	Trigger oscilloscope externally from TP-2 and set trigger slope to "+".  6.5 ± 0.5 H V. sync CH-2 Trigger point (switching point)
14	REC CTL Delay	TP-14	R96 (CTL REC D)	Color Bar	REC	

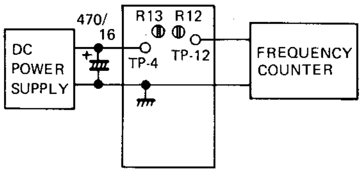
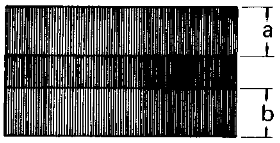
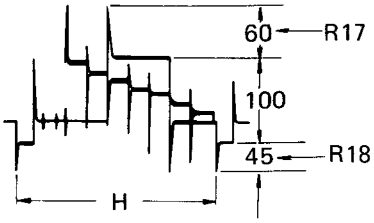
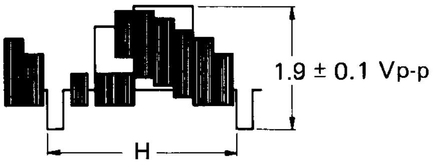
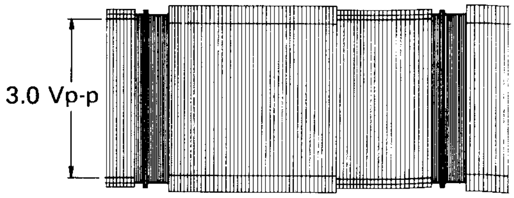
No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
15	P.B. CTL Delay	TP-13	R98 (CTL P.B. D)	Color Bar	REC ↓ P.B.	
16	Tracking Pre-set	TV Screen	R2 (Pre-set)	Stairstep (Color Bar)	REC ↓ P.B.	1. Set R1 (Tracking) to the center click position. 2. Observe the TV screen and adjust R2 (Pre-set) to minimize dihedral error. 
17	CTL Amp Noise	TP-11	–	–	STILL	
18	Drum Sampling Pulse	TP-4	–	Color Bar	REC ↓ P.B.	The sampling pulse is positioned at about center of the ramp. 
19	Drum Lock-In Time	TP-4	–	Color Bar	REC	In the transition from the Stop mode, with the drum completely stopped, to the REC mode, the sampling pulse shall stabilize within 10 seconds. If abnormal, check Step 9 again.
20	Drum Motor Input	TP-8	–	Color Bar	REC	
21	Tape Speed	TP-2/Audio (or Audio Out)	–	MH-2 3 kHz	P.B.	3000 ± 9 Hz. This is also true if TP-3, TP-6 and TP-26 are shorted. If abnormal, check Step 3 again.
22	Shuttle Search Tape Speed	TP-12	–	Color Bar	REC ↓ SEARCH	T1 is less than 0.5 msec. 
23	Shuttle Search Drum Speed	TV Screen	R26 (FWD) R29 (REV)	Color Bar	REC ↓ SEARCH	Confirm that color bars appear properly on the TV screen.

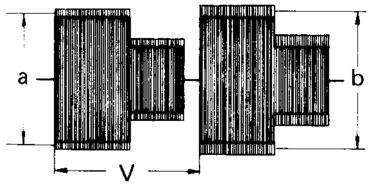
No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
24	Slow Pulse	TV Screen	R196 (S. Pos.) R189 (Pre-set)	Color Bar	REC ↓ SLOW	1. Adjust the Slow speed for maximum and set R191 (Slow track) to the center click position. 2. Observe the TV screen and adjust R196 and R189 so that the bar noise is most nearly (or completely) eliminated from the picture. 3. Check that the noise bar moves when R191 is varied.
25	Drum Vibration	TV Screen	R203 (D. VIB.)	Color Bar	REC ↓ SLOW	1. Adjust the Slow speed for maximum. 2. Observe the TV screen and adjust R203 (D. VIB.) for minimum horizontal swing.
26	V. Pulse	TP-27	R198 (CH-2 V.P.) R33 (CH-1 V.P.)	Color Bar	REC ↓ STILL	1. Set R198 to the center of variable range. 2. Trigger the oscilloscope externally from TP-2. 3. Adjust R33 to obtain T1 of 100 µsec.  (+) trigger T1 = 100 µs T2 = 300 ± 100 µs T1 T2 (–) trigger T3 T3 = 300 ± 50 µs Note: If customer's TV set is available, observe display on screen and adjust R198 (hole in bottom cover) to minimize vertical jitter.
					STILL SLOW SEARCH	Confirm that the V. pulse is present during the Still, Slow and Shuttle Search modes.
27	CTL Head	TP-5 Pre/Rec TV Screen	–	MH-2 Stairstep	P.B.	Perform after completing No. 24. 1. Set R191 (Slow track) to the center click position. 2. Adjust the CTL head position to obtain maximum FM waveform at TP-5 on PRE/REC board. 3. If noise bar appears on the TV screen in Slow mode, carefully adjust the head position to remove the noise bar from the picture.

6.5 VIDEO SYSTEM

No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
1	Video Head Resonance and Q.	TP-5 Pre/Rec	R35 (CH-1 Q) R36 (CH-2 Q) C17 (CH-1 fo) C18 (CH-2 fo) Pre/Rec.	MH-2 RF Sweep	P.B.	NOTE: This adjustment is required only after replacing the upper drum (video heads). 1. Trigger the oscilloscope externally from TP-2 on Servo board. 2. Turn R35 fully counterclockwise and R36 fully clockwise. 3. Adjust C17 to set the CH-1 resonance point to 4.5 MHz and C18 to set the CH-2 resonance point to 4.5 MHz. Note: 1. The MH-2 marker appears at 5.0 MHz. However, adjust for 4.5 MHz. 2. Use (−) trigger for CH-1 and (+) for CH-2.  4. Adjust R35 so that the CH-1 waveform becomes similar to the CH-2 waveform. 5. Record a video signal, then play back. Confirm absence of flicker and black-white reversal in the reproduced picture. If necessary, carefully readjust R35 and R36.
2	P.B. Color Level	TP-2 Chroma	R51 (P.B. Color) Pre/Rec	MH-2 Color Bar	P.B.	1. Adjust R1 (tracking) to obtain maximum FM waveform of TP-5 on Pre/Rec board. 2. Trigger the oscilloscope externally from TP-2 on Servo board.  $\frac{a+b}{2} = 0.1 \pm 0.02$ Vp-p Channel difference within 3 dB.
3	Limiter Balance	TP-7 Y	R73 (Limiter Bal.) Y	MH-2 RF Sweep	P.B.	Adjust R73 to obtain a single line as shown in the figure. 
4	P.B. Video Level	TP-8 Y	R57 (P.B. Y. Level) Y	MH-2 Color Bar	P.B.	
5	AFC	TP-6 Chroma	R46 (AFC) Chroma	Color Bar	REC	Connect an electrolytic capacitor (470 μ/16 V) between TP-4 and ground. 15.625 kHz ± 50 Hz

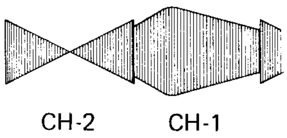
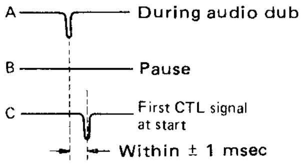
No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
6	VXO-1	TP-7 Chroma	R77 (VXO-1) Chroma	Color Bar	REC	4.435571 MHz ± 50 Hz
7	VXO-2	TP-9 Chroma	R111 (VXO-2) Chroma	Stairstep	REC	4.433619 MHz ± 100 Hz Change to a color bar input signal and confirm 4.433619 MHz ± 10 Hz.
8	P.B. 4.43 MHz	TP-7 Chroma	C46 (P.B. 4.43 MHz) Chroma	Color Bar	REC ↓ P.B.	4.433619 MHz ± 50 Hz
9	Converter Balance	TP-1 Chroma	R17 (Balance) Chroma	Color Bar	REC ↓ P.B.	Adjust R17 for minimum leakage of the 5.06 MHz component. 
10	Cross-talk Cancel	TV Screen	R33 (Cross-talk)	Coloar Bar	REC ↓ P.B.	1. Turn R1 (TRACKING) to where horizontal noise appears on the TV screen. 2. Adjust R13 to minimize the noise.
11	ACC Output Level	TP-1 Chroma	R89 (ACC Out Level)	Color Bar	REC ↓ P.B.	Trigger the oscilloscope externally from TP-2 of Servo board.  $\frac{a+b}{2} = 0.2 \pm 0.02$ Vp-p
12	Color Output Level	TP-8 Y	R24 (Color Level) Chroma	Color Bar	REC ↓ P.B.	
13	Carrier Deviation	TP-4 TP-12 Y	R13 (Carrier Bal.) R12 (Carrier) R38 (Deviation) Y	Color Bar	STOP	NOTE: 1. These adjustments are generally unnecessary except when replacing IC2 of the Y board. 2. Before adjustment, turn R17 (White clip) and R18 (Dark clip) fully clockwise. After adjustment, perform No. 11. 1. Connect an oscilloscope to TP-4 of Y board and precisely measure the DC potential of the sync tip. Make a note of this as voltage "A".  2. Connect a 470 μF/16 V electrolytic capacitor between TP-4 and ground.

No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
13						3. Set a DC power supply to precisely voltage "A" and apply this voltage between TP-4 and ground. 4. Connect an oscillscope and a frequency counter to TP-12.  470/ 16 R13 R12 DC POWER SUPPLY TP-4 TP-12 FREQUENCY COUNTER 5. Adjust R13 so that the modulation waveform becomes symmetrical vertically.  a = b 6. Adjust R12 for 3.8 MHz at TP-12. 7. Carefully adjust the DC power supply to obtain 4.8 MHz at TP-12. 8. Connect an oscilloscope to TP-4 and precisely read the voltage of the DC power supply at this time. Make a note of it as voltage "B". 9. Disconnect the capacitor, DC power supply and frequency counter. 10. Adjust R38 so that the white peak at TP-4 becomes equal to voltage "B".
14	White Clip Dark Clip	TP-3 Y	R17 (White Clip) R18 (Dark Clip) Y	Color Bar	STOP	Adjust R17 and R18 to obtain relations shown in the figure. 
15	E-E Level	TP-8 Y	R27 (E-E) Y	Color Bar	STOP	
16	REC FM Level	TP-1 Pre/Rec	R1(REC FM) Pre/Rec	Color Bar	REC	

No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
17	REC Color Level and Balance	TP-2 Chroma	R2 (Rec. Col.) R24 (Rec. Col. Bal.) Pre/Rec	Color Bar	REC ↓ P.B.	1. Trigger the oscilloscope externally from TP-2 of Servo board. 2. During recording, adjust R2 and R24 so that the CH-1 (a) and CH-2 (b) color output levels become the same as the levels of No. 2 during playback. Trigger (–) 
18	SECAM Detector	TP-11 S. Det.	R95 (SECAM Det.) L10 S. Det.	SECAM Color Bar	REC ↓ P.B.	1. Set R95 to about the center of rotation. 2. Adjust L10 for maximum DC voltage at TP-11. 3. Then adjust R95 for 8 ± 0.2 V at TP-11.

6.6 PAUSE TIMING

Note: Perform the following steps only after completing mechanical adjustments.

No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
1	Stop Timing	TP-5 Pre/Rec	R14 (Edit-2) Mechacon	Color Bar	REC ↓ AUDIO DUB	1. Trigger the oscilloscope externally from TP-2 of Servo board. 2. Adjust R14 so that when the PAUSE button is pressed during Audio Dub mode, the minimum component of the FM output (noise position) becomes located at the center of the CH-2 FM waveform. Trigger (+) 
2	Start Timing	TP-11 Servo	R13 (Edit-1) Mechacon	Color Bar	REC ↓ AUDIO DUB	1. Trigger the oscilloscope externally from TP-2 of Servo board. 2. During Audio Dub mode, observe the CTL signal when the servo is fully locked. 3. When the PAUSE button is pressed, then PLAY button is pressed, so that the position of the first CTL signal becomes the same (within ±1 msec), adjust R13. Trigger (+)  A During audio dub B Pause C First CTL signal at start Within ± 1 msec

6.7 AUDIO

Note: Adjustment parts are located on the Audio & CPU board.

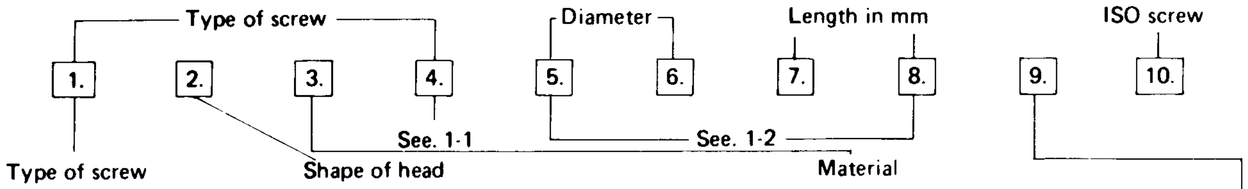
No.	Item	Check Point	Adjustment Parts	Signal	Mode	Description and Waveform
1	E-E Level	Audio Out	R45 (E-E Level)	1 kHz −24 dB (0.14 Vp-p) Sine-wave	STOP	−10 dB (0.72 Vp-p)
2	AGC	Audio Out	–	1 kHz 0 dB (2.2 Vp-p) Sine-wave	STOP	−2 dB (1.8 Vp-p) or less
3	P.B. Level	Audio Out	R36 (P.B. Level)	MH-2 1 kHz (Color Bar)	P.B.	−6 dB (1.1 Vp-p)
4	Bias Level	TP-23 Audio & CPU	R81 (Bias)	No Signal	REC	60 Vp-p 70 ± 5 kHz
5	REC Level	Audio Out	R43 (REC Level)	1 kHz −24 dB (0.14 Vp-p) Sine-wave	REC ↓ P.B.	Adjust R43 during Record mode so that the output level is −10 ± 1 dB during playback.

SECTION 7
EXPLODED VIEWS AND PARTS LIST

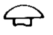
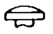
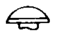
IMPORTANT SAFETY NOTICE

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

7.1 GENERAL RULES FOR NUMBERING METHOD OF SCREW/WASHER/E-RING



S	Normal screw
N	Assembly screw
L	"
D	"
M	W. Wood screw
F	Feather screw
T	Set screw
Y	"
B	Bolt
N	Nut
W	Washer
R	E-ring
E	–
P	Spring

P		Pan head
S		Flat countersunk head
H		Oval countersunk head
D		Binding head
R		Round head
B		Round head
T		Truss head

Symbol letter	Material
S	Steel
E	Stainless steel
C	Cast iron
U	Bronze
B	Brass
P	Phosphor bronze
N	German silver
Y	Brass
A	Aluminum
Z	Zinc-alloy

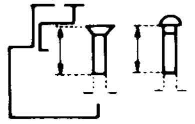
7.1.1 Type of screw

P	Cross-Recessed head screw
A	Tapping screw
B	Tapping screw

7.1.2 Diameter and Length of screw

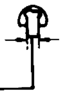
– Example –

SPBP3010ZS



(Diameter x 10)

E-ring Washer

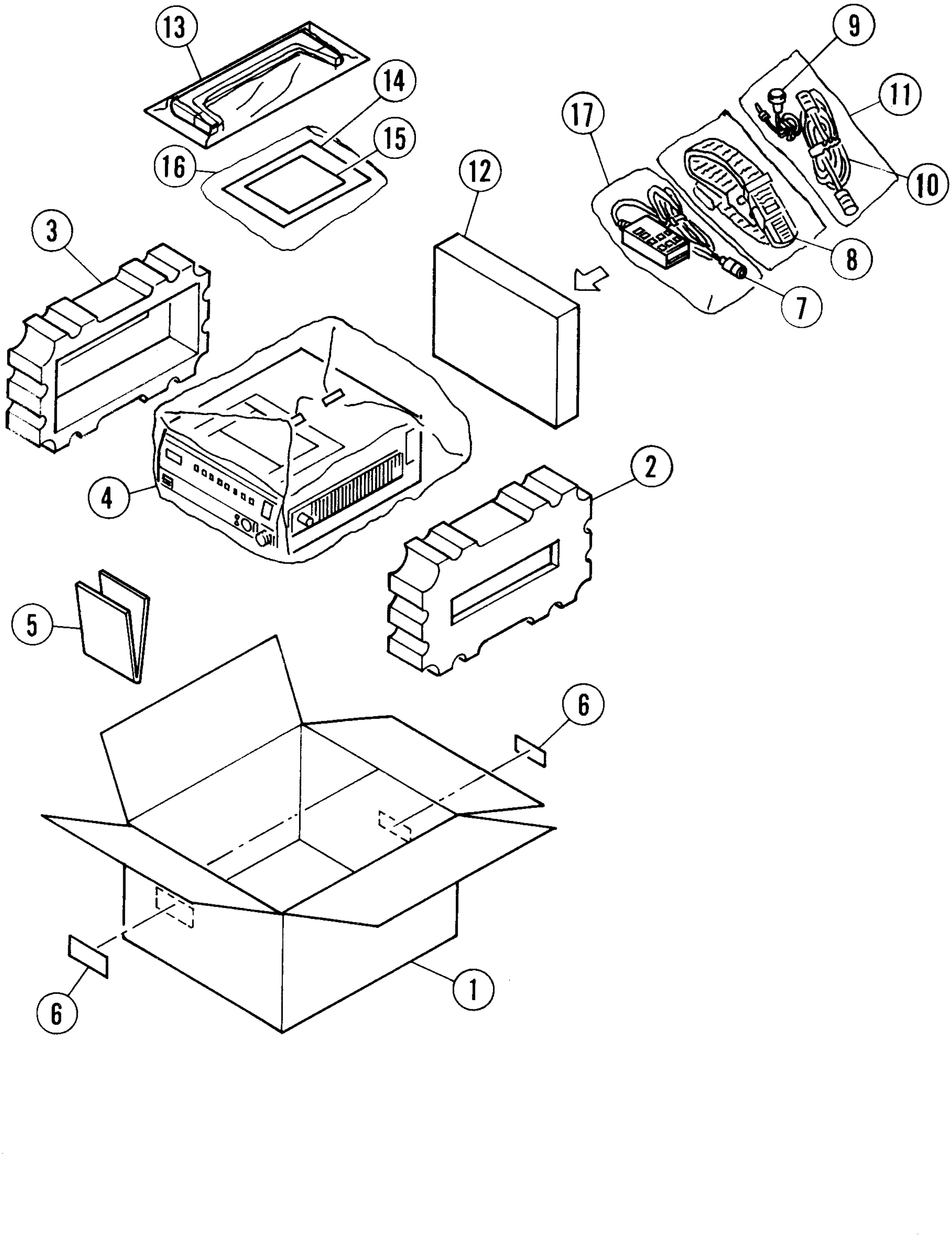


REE3000 WNS3000N

Surface treatment

Symbol letter	Surface treatment
Z	Galvanization, dichromic acid treatment (MFZn2-C)
N	Nickel plating (MFNi2, MFNil)
R	Chrome plating (MBCr2, MBCr1)
G	Silver plating (SP4)
W	Nichrome platings
P	Phosphite treatment
B	Bronze plating
M	Black coloring after galvanization
F	Iron with black coloring

7.2 PACKING ASSEMBLY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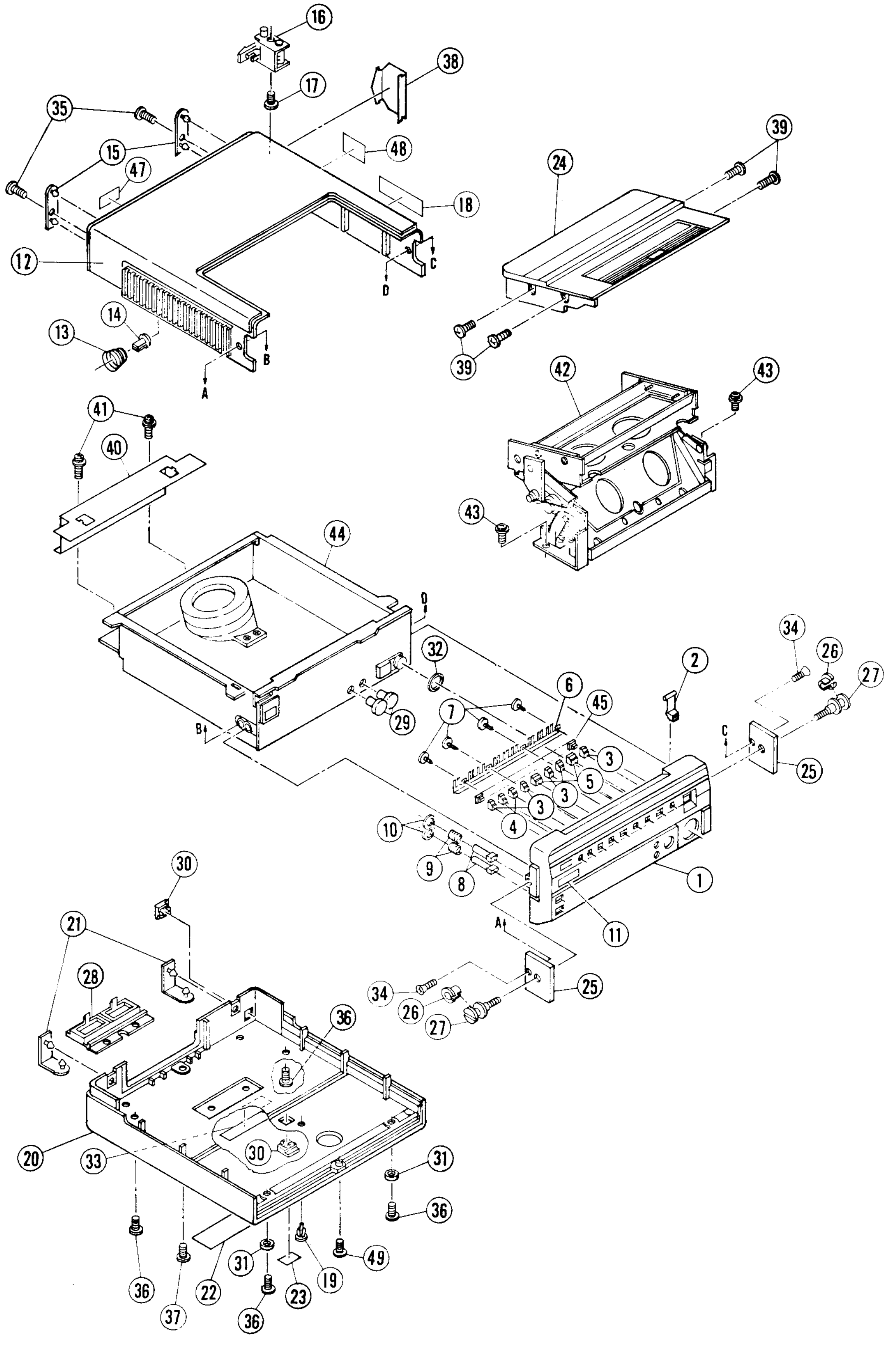
Symbol No.	Part No.	Part Name	Description	Q'ty
	PUP30457C	Packing Ass'y	EG Incl. (1) – (3)	1
	" D	"	EK "	1
1	PUP30457-5	Packing Case	EG	1
	" -6	"	EK	1
2	PUP10100	Right Cushion		1
3	PUP10101	Left Cushion		1
4	PUP40324-7	Poly Bag		1
5	PUP40570	Spacer		1
6	PUP40329	Ser. No. Sticker		1
7	PU49546C	Remote Control Unit	Incl. (17)	1
8	PU49560	Shoulder Belt		1
9	QME1308-009	Earphone		1
10	PU43294F	Aerial Cable Ass'y		1
11	QPGA015-03005	Poly Bag		1
12	PUP40185	Case		1
13	PU49792C	Handle		1
14	PU30425-339	Instruction Book		1
15	PU32004	Guarantee Card	EK only	1
16	QPGB024-03404	Poly Bag		1
17	PU45943-2	Electrically Conductive Bag		1

7.3 CABINET ASSEMBLY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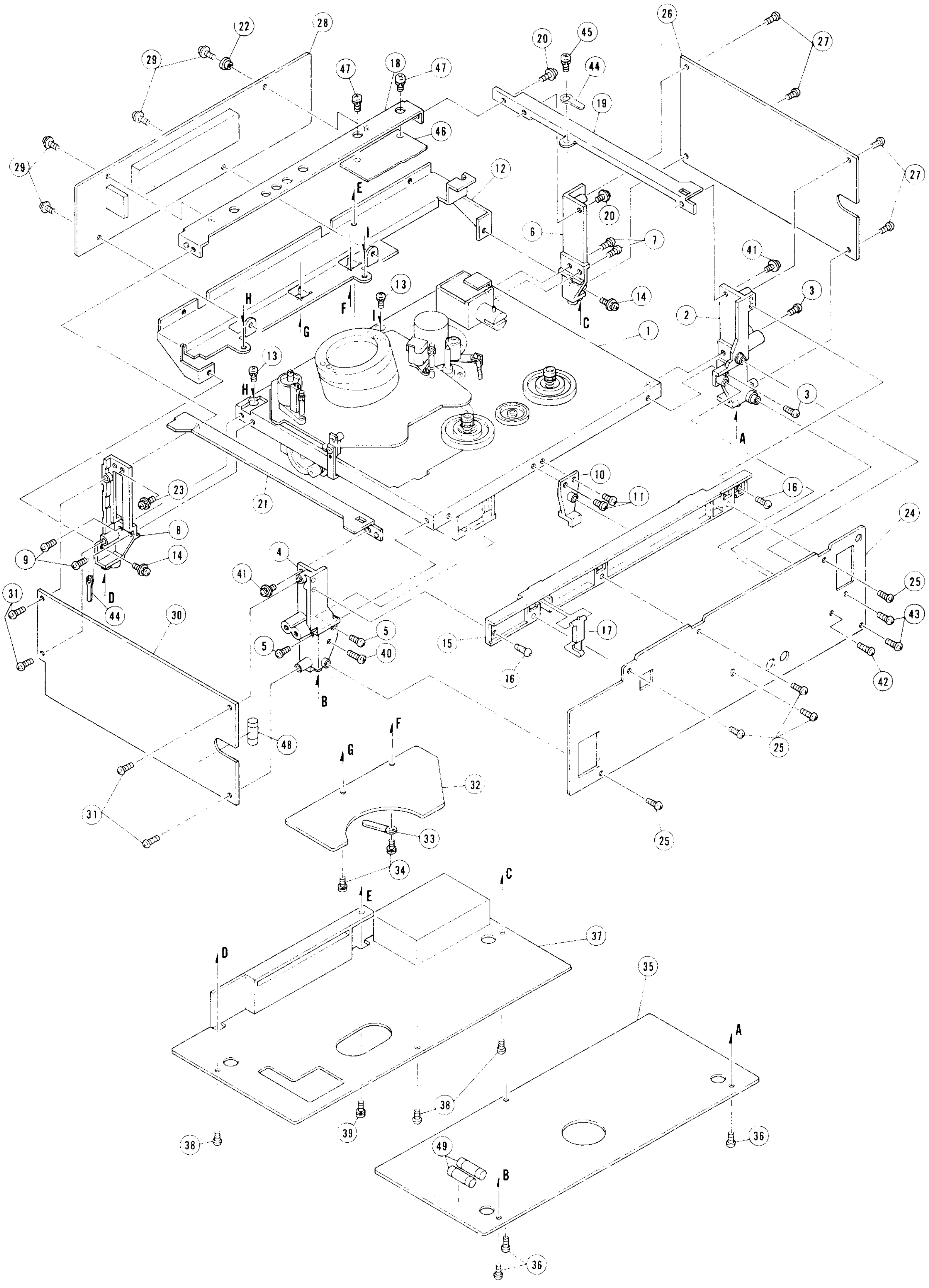
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU20953C	Front Panel Ass'y	Incl. (2)–(11), (45)	1
2	PU49223	Eject Knob		1
3	PU49225-1	Select Button (1)	FF, REW, FWD, REV, PAUSE/STILL	5
4	" -2	" (2)	REC, AUDIO DUB	2
5	" -3	" (3)	STOP, PLAY	2
6	PU49227	Button Spring		1
7	SBSE2606Z	Tapping Screw		4
8	PU49228	Power Switch Knob		2
9	PU30080-70	Spring		2
10	PU48868-3	Slit Washer		2
11	PU49328	Mark	JVC	1
12	PU20954B	Top Cover Ass'y	Incl. (13) – (17)	1
13	PU49206	Corn Spring		1
14	PU49958	Cap		1
15	PU49232	Rubber Supporter (A)		2
16	PU49233A	Battery Stopper Ass'y		1
17	SBSE3008Z	Tapping Screw		1
18	PU46127-3	Label	DO NOT OPEN	1
19	PU50346	Plastic Rivet		1
20	PU20955G	Bottom Cover Ass'y	Incl. (21)	1
21	PU49241	Rubber Supporter (B)		2
22	PU31891-15	Serial No. Plate	EG	1
	" -16	"	EK	1
23	PU50387-2	Label	V-LOCK	1
24	PU32515C	Cassette Cover Ass'y		1
25	PU49243	Side Plate		2
26	PU49862	Collar		2
27	PU49244	Hook Screw		2
28	PUS46271A	Connector Cover		1
29	PU49248	Knob	TRACKING	2
30	PU49887	Cap		2
31	PU49250	Foot		2
32	PU49320	Connector Plate	for CAMERA Connector	1
33	PU47385-2	Label		1
34	SHSP3010RS	Screw		2
35	SDSP3006FS	"		2
36	SBSE3012F	Tapping Screw		4
37	SBSE3010F	"		1
38	PU49732	Cover		1
39	SDSP3012NS	Screw		4
40	PU32514	Shield Plate		1
41	DPSP3006ZS	Screw		2
42	–	Cassette Housing Ass'y	See Sec. 7.9.	1
43	SBSE3010Z	Tapping Screw		2
44	–	Chassis Ass'y	See Sec. 7.4.	1
45	PU49226	Button Cushion		9
46	–	–	–	–
47	PU49729	Label	EK only	1
48	PU49728	Sticker	EK only	1
49	SBSE3016F	Tapping Screw		1

7.4 CHASSIS ASSEMBLY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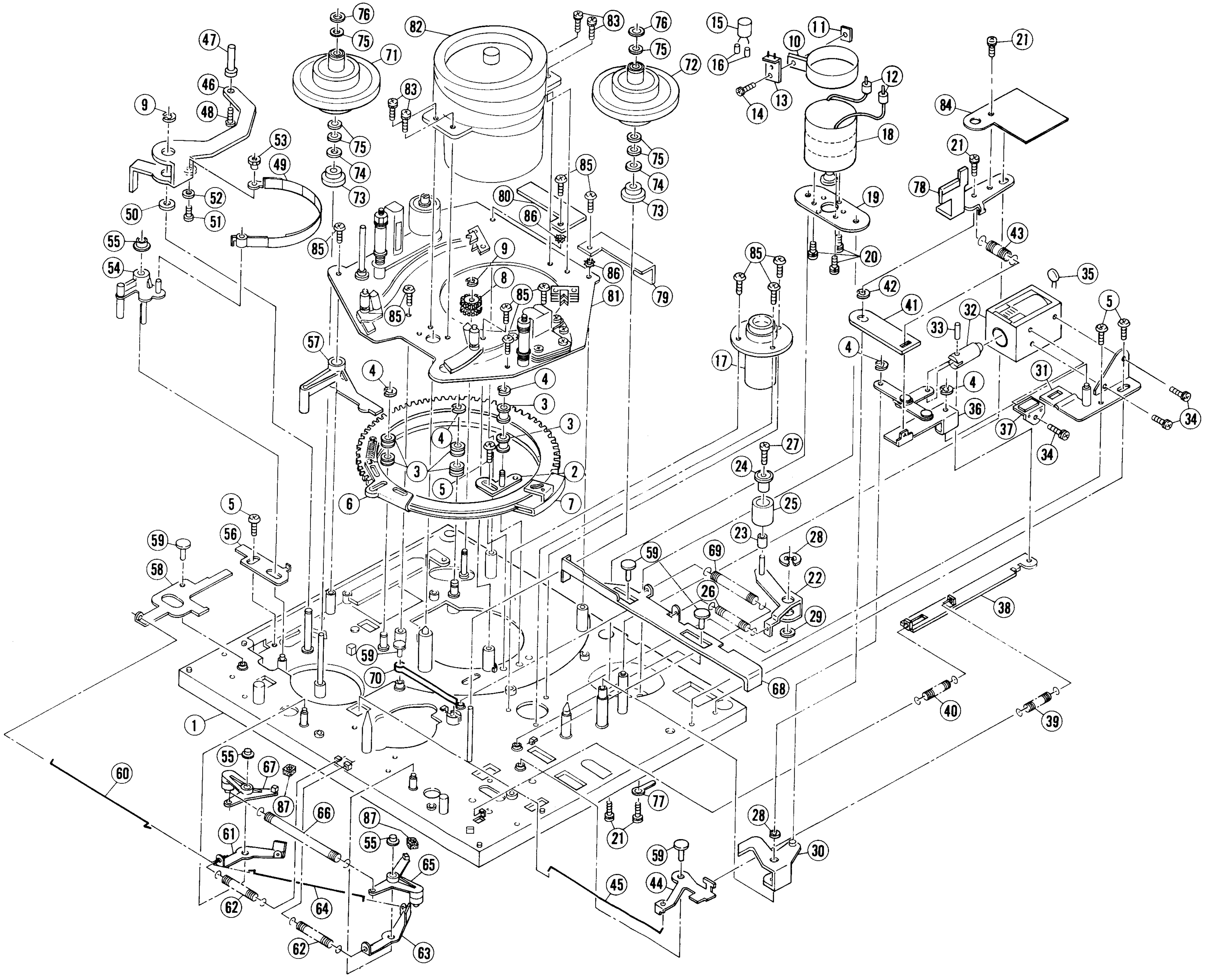
Symbol No.	Part No.	Part Name	Description	Q'ty
1	–	Main Deck Ass'y	See Sec. 7.5, 7.6, 7.7, and 7.8.	1
2	PUS46291A	Front Supporter (R) Ass'y		1
3	SBSE3008Z	Tapping Screw		2
4	PUS46290A	Front Supporter (L) Ass'y		1
5	SBSE3008Z	Tapping Screw		2
6	PU48990	Rear Supporter (R)		1
7	SBSE3008Z	Tapping Screw		2
8	PU48991	Rear Supporter (L)		1
9	SBSE3008Z	Tapping Screw		2
10	PU48992	Printed Board Adapter		1
11	SBSE3008Z	Tapping Screw		2
12	PU32478	Frame		1
13	LPSP3006ZS	Screw		2
14	DPSP3008ZS	"		2
15	PU32477	Front Beam		1
16	SBSE3008Z	Tapping Screw		2
17	PU49246	Record Safety Lever		1
18	PU48995-1-2	Rear Beam		1
19	PU48994	Right Beam		1
20	DPSP3008ZS	Screw		2
21	PU48993	Left Beam		1
22	PU41624-6	Isolation Washer		1
23	DPSP3008ZS	Screw		1
24	–	Mechanism Control Circuit Board Ass'y	See Sec. 9.5.2.	1
25	SBSE3008Z	Tapping Screw		5
26	–	Audio & CPU Circuit Board Ass'y	See Sec. 9.5.1.	1
27	SBSE3008Z	Tapping Screw		4
28	–	Pre/Record Amplifier Circuit Board Ass'y	See Sec. 9.5.3	1
29	DPSP3006ZS	Screw		4
30	–	Chroma Circuit Board Ass'y	See Sec. 9.5.4	1
31	SBSE3010Z	Tapping Screw		4
32	–	MDA Circuit Board Ass'y	See Sec. 9.5.7	1
33	PUS45919A	Wire Clamp		1
34	LPSP3006ZS	Screw		2
35	–	Servo Circuit Board Ass'y	See Sec. 9.5.6	1
36	SBSE3008Z	Tapping Screw		3
37	–	Y Amplifier Circuit Board Ass'y	See Sec. 9.5.5	1
38	SBSE3008Z	Tapping Screw		3
39	SDSP3006ZS	Screw		1
40	SPSP3014ZS	"		1
41	SDSP3005ZS	"		2
42	SBSE3016Z	Tapping Screw		1
43	SBSB3010Z	"		2
44	PUS45919A	Wire Clamp		2
45	LPSP3006ZS	Screw		1
46	–	SECAM Detector Circuit Board Ass'y	See Sec. 9.5.9. EG only	1
47	LPSP3006ZS	Screw	EG only	2
⚠ 48	QMF51A2-1R0-BS	Fuse	F1	1
⚠ 49	" -2R0-BS	"	F2, F3	2

7.5 MAIN DECK (1) ASSEMBLY



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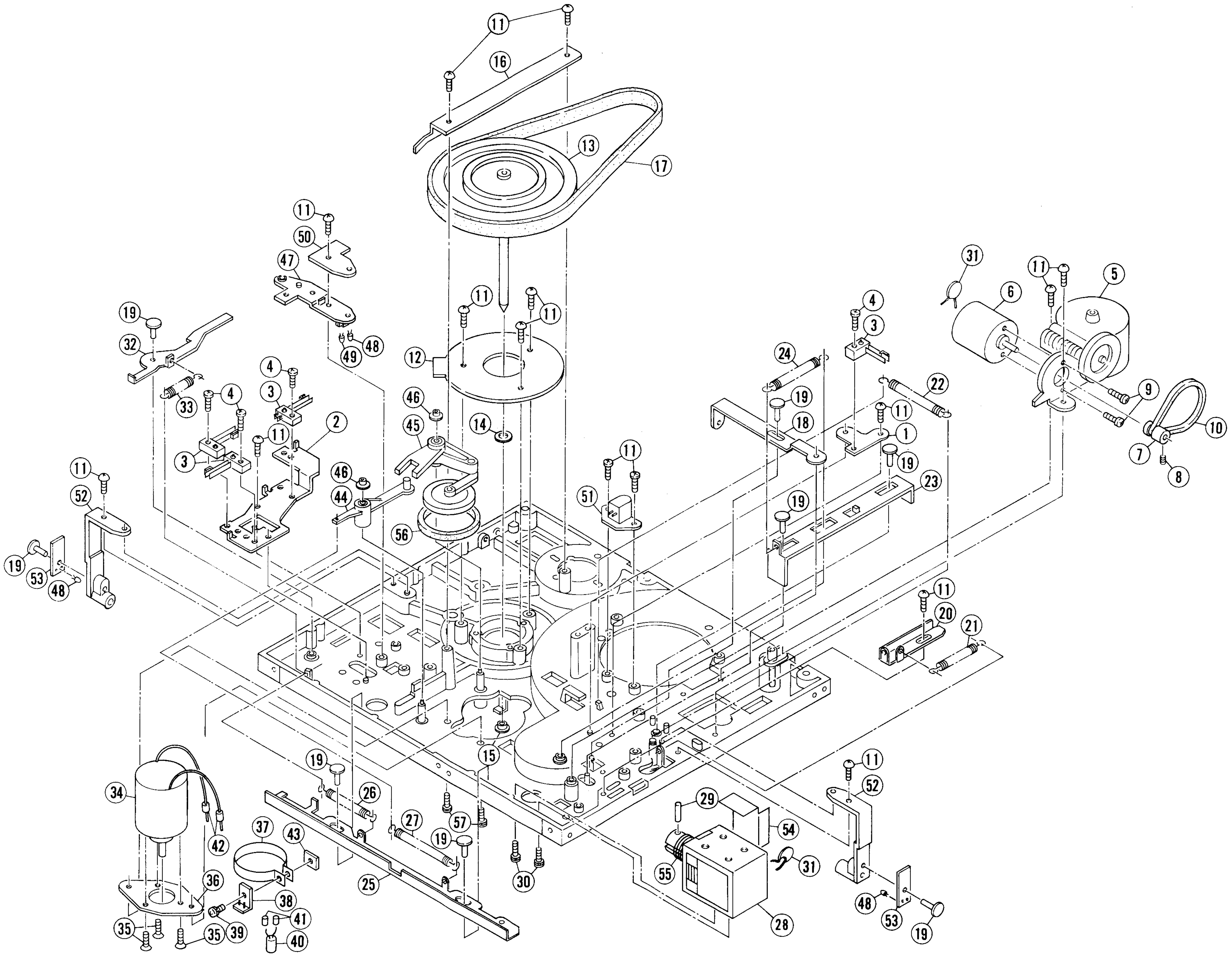
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU10262A	Main Deck Ass'y		1
2	PU48708A	Plate Ass'y		1
3	PU48711	Pulley		6
4	REE3000	E-Ring		5
5	SBSE3008Z	Tapping Screw		4
6	PU48837A	Supply Loading Ring Ass'y		1
7	PU48838A	Take-up Loading Ring Ass'y		1
8	PU48716	Gear (A)		1
9	REE2500	E-Ring		2
10	PU49159	Motor Band		1
11	PU43730	Tapping Plate		1
12	PU45811	Ferrite Beads		2
13	V03082-2	Feed Through Capacitor		1
14	LPSP3008ZS	Screw		1
15	QEW41HA-105	Electrolytic Capacitor		1
16	QXT3100-010	Tube		2
17	PU48752A	Capstan Holder Ass'y		1
18	PU49695S	Capstan Motor Ass'y		1
19	PU49658	Motor Holder		1
20	LPSP2004Z	Screw		3
21	LPSP3006ZS	Screw		4
22	PU48765A	Pinch Roller Arm Ass'y		1
23	PU48841	Collar		1
24	PU48840	Cap		1
25	PU47549A	Pinch Roller Ass'y		1
26	PU35005-22	Spring		1
27	LPSP2606Z	Screw		1
28	REE5000	E-Ring		2
29	Q03093-508	Washer		1
30	PU48768B	Pinch Roller Lever Ass'y		1
31	PU48770A	Solenoid Holder Ass'y		1
32	PU48853	Solenoid		1
33	PRE3020	Spring Pin		1
34	LPSP3005ZS	Screw		3
35	PU49624	Varistor		1
36	PU48773A	Lever Ass'y		1
37	PU48848A	Dew Sensor Ass'y		1
38	PU48777	Pinch Slide Plate		1
39	T30300-43	Spring		1
40	″ -029	″		1
41	PU48778	Lever		1
42	REE4000	E-Ring		1
43	T30300-61	Spring		1
44	PU48779	Skew Lever		1
45	PU48780	Rod		1
46	PU48782	Tension Arm		1
47	PU44852	Tension Pole		1
48	SSSP2604Z	Screw		1
49	PU48784A	Tension Band Ass'y		1
50	Q03093-826	Washer		1
51	SPBP2006N	Screw		1
52	WLS2000N	Lock Washer		1
53	PU48791	Washer		1
54	PU48792	Skew Arm		1
55	PU48793	Cap		3
56	PU48795	Bracket		1
57	PU48796	Cancel Lever		1
58	PU48798	Lever		1
59	PU48973	Stopper		5
60	PU48799	Rod (2)		1
61	PU48800A	Supply Tension Brake Ass'y		1
62	T30300-200	Spring		2
63	PU48800B	Take-up Tension Brake Ass'y		1
64	PU48803	Rod (3)		1
65	PU50481A	Take-up Main Brake Ass'y	Incl. (87)	1
66	T30300-78	Spring		1
67	PU50481B	Supply Main Brake Ass'y	Incl. (87)	1
68	PU48808	Slide Lever		1
69	T30300-49	Spring		1
70	PU48819	Leaf Spring		1
71	PU48820A	Supply Reel Disk Ass'y		1
72	PU48825A	Take-up Reel Disk Ass'y		1
73	PU45789	Collar		2
74	Q03093-828	Washer		2
75	″ -827	″		6
76	PU48868	Slit Washer		2
77	PUS45919-A	Wire Clamp		1
78	PU50219A	Cassette Door Guide Ass'y		1
79	PU49597	Earth Plate (A)		1
80	PU49598	″ (B)		1
81	–	Sub-Deck Ass'y	See Sec. 7.7.	1
82	–	Drum Ass'y	See Sec. 7.8.	1
83	LPSP3010ZS	Screw		4
84	–	Terminal Circuit Board Ass'y	See Sec. 9.5.8.	1
85	SBSE3010Z	Tapping Screw		10
86	WABS3000N	Washer		2
87	PU50483	Rubber Tire		2

7.6 MAIN DECK (2) ASSEMBLY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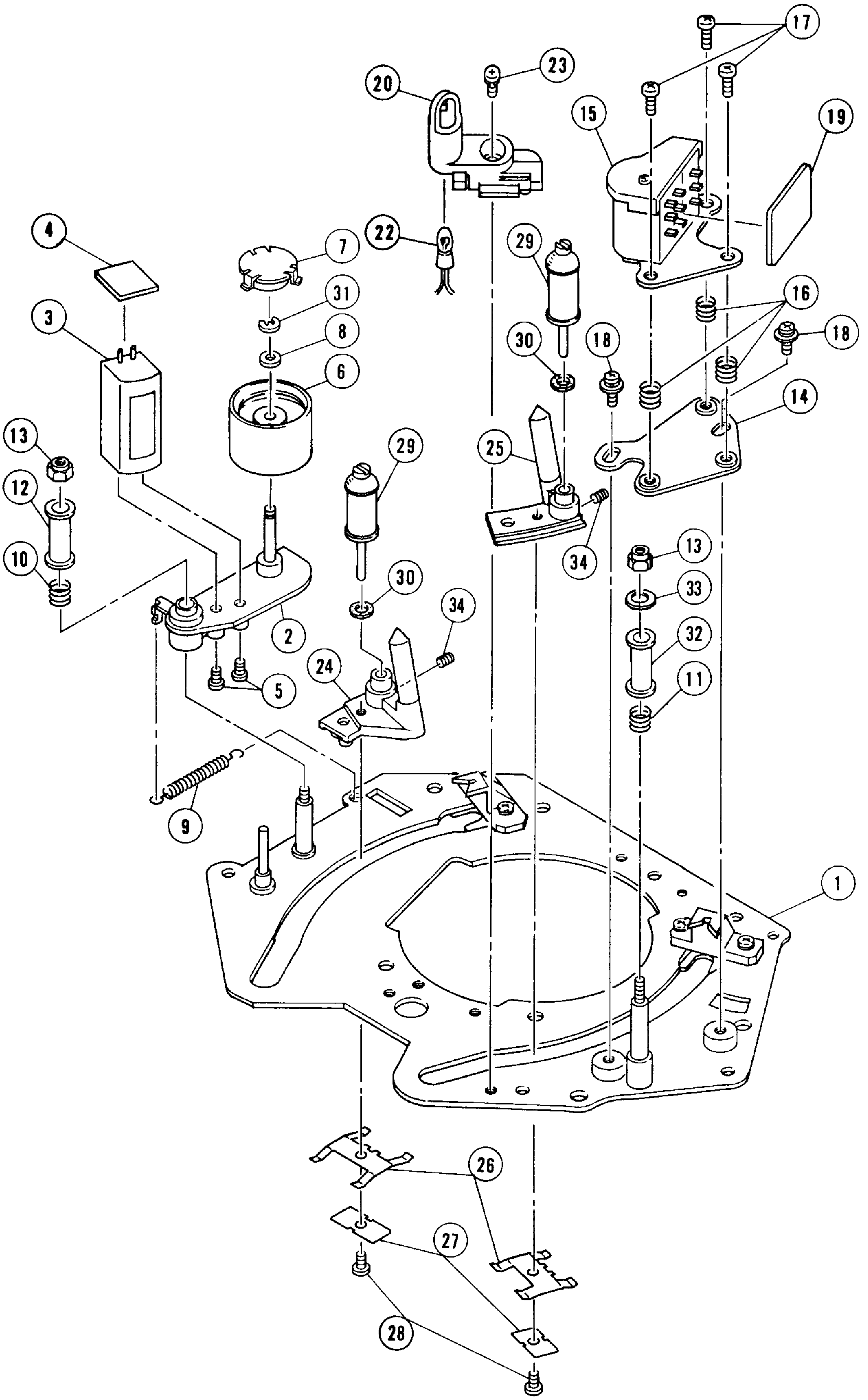
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU48707	Switch Holder (1)		1
2	PU48831	" (2)		1
3	PU49617	Leaf Switch		4
4	LPSP2610Z	Screw		4
5	PU48717A-2	Loading Gear Ass'y		1
6	PU48854	Loading Motor		1
7	PU48852A	Motor Pulley	Incl. (8)	1
8	YWS3003PS	Setscrew		1
9	LPSP2606Z	Screw		2
10	PU48726	Belt		1
11	SBSE3008Z	Tapping Screw		15
12	PU48755	FG Circuit Board		1
13	PU48756A	Capstan Flywheel Ass'y		1
14	Q03093-819	Washer		1
15	PU48760	Shield Cap		1
16	PU48761A	Stay Ass'y		1
17	PU48764	Belt		1
18	PU48781	Slide Plate		1
19	PU48973	Stopper		8
20	PU48794	Spring Hook		1
21	PU35005-26	Spring		1
22	" -46	"		1
23	PU48797	After Loading Plate		1
24	PU35005-28	Spring		1
25	PU32431	Main Slide Plate		1
26	PU35005-46	Spring		1
27	T30300-007	"		1
28	PU48853-2	Solenoid		1
29	PRE3020	Spring Pin		1
30	LPSP3006ZS	Screw		2
31	PU49624	Varistor		2
32	PU48807-2	Eject Lock Lever		1
33	T30300-114	Spring		1
34	PU49694S	Reel Motor	or PU49694V	1
35	SSSP2004	Screw		3
36	PU48809	Motor Holder		1
37	PU49159	Motor Band		1
38	V03082-2	Feed Through Capacitor		1
39	LPSP3008ZS	Screw		1
40	QEN41HM-105	Electrolytic Capacitor		1
41	QXT3100-010	Tube		2
42	PU45811	Ferrite Beads		2
43	PU43730	Tapping Plate		1
44	PU48818	Idler Lever (3)		1
45	PU48811B	Idler Ass'y	Incl. (56)	1
46	PU48793	Cap		2
47	PU48830	Photo Coupler		1
48	PN202S	Photo Transistor		3
49	TLR108D	Light Emitting Diode (LED)		1
50	PU49135	Sensor Circuit Board		1
51	PU48839	Pick-up Head Ass'y		1
52	PU49137	Sensor Holder		2
53	PU49136	Sensor Circuit Board		2
54	PU49937	Insulator		1
55	PU30080-72	Compression Spring		1
56	PU48806	Rubber Tire		1
57	LPSP2606Z	Screw		2

7.7 SUB-SECK ASSEMBLY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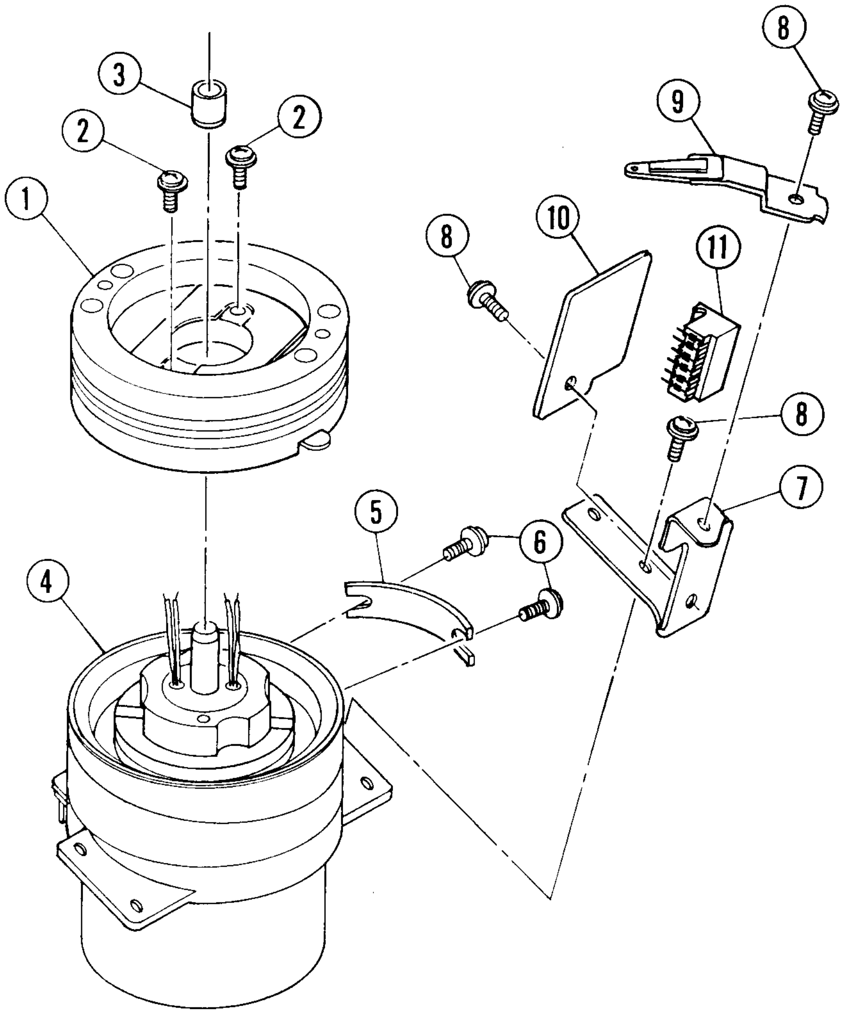
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PUS46182-A	Sub-Deck Sub-Ass'y		1
2	PU49555A	Full Erase Head Arm Sub-Ass'y		1
3	PU47863	Full Erase Head	or PU31013-2T	1
4	PU49134	Full Erase Head Circuit Board		1
5	LPSP2004Z	Screw		2
6	PU48079A	Impedance Roller Ass'y		1
7	PU47819	Thrust Bearing		1
8	Q03093-830	Washer		1
9	T30300-004	Spring		1
10	PU30080-69	Compression Spring		1
11	PU30080-49	"		1
12	PU48733	Guide Pole		1
13	PU49276	Nylon Nut		2
14	PU48734	Base (1)		1
15	PU49556T	Audio/Control Head Ass'y		1
16	PU30080-49	Compression Spring		3
17	SPBP3008NS	Screw		3
18	DPSP3006ZS	"		2
19	PU46436	Head Circuit Board		1
20	PU48737	Lamp Holder		1
21	–	–		–
22	QLP3104-111	Lamp		1
23	LPSP3006ZS	Screw		1
24	PU48740A	Supply Pole Base Ass'y		1
25	PU48745A	Take-up Pole Base Ass'y		1
26	PU48747	Spring Plate		2
27	PU49822	Plate		2
28	SDSP2606Z	Screw		2
29	PU48748A	Guide Roller Ass'y		2
30	PU48806-3	Rubber Tire		2
31	REE1500	E-Ring		1
32	PU48733-2	Guide Pole		1
33	PU50253	Tape Guide		1
34	YFS3025S	Setscrew		2

7.8 DRUM ASSEMBLY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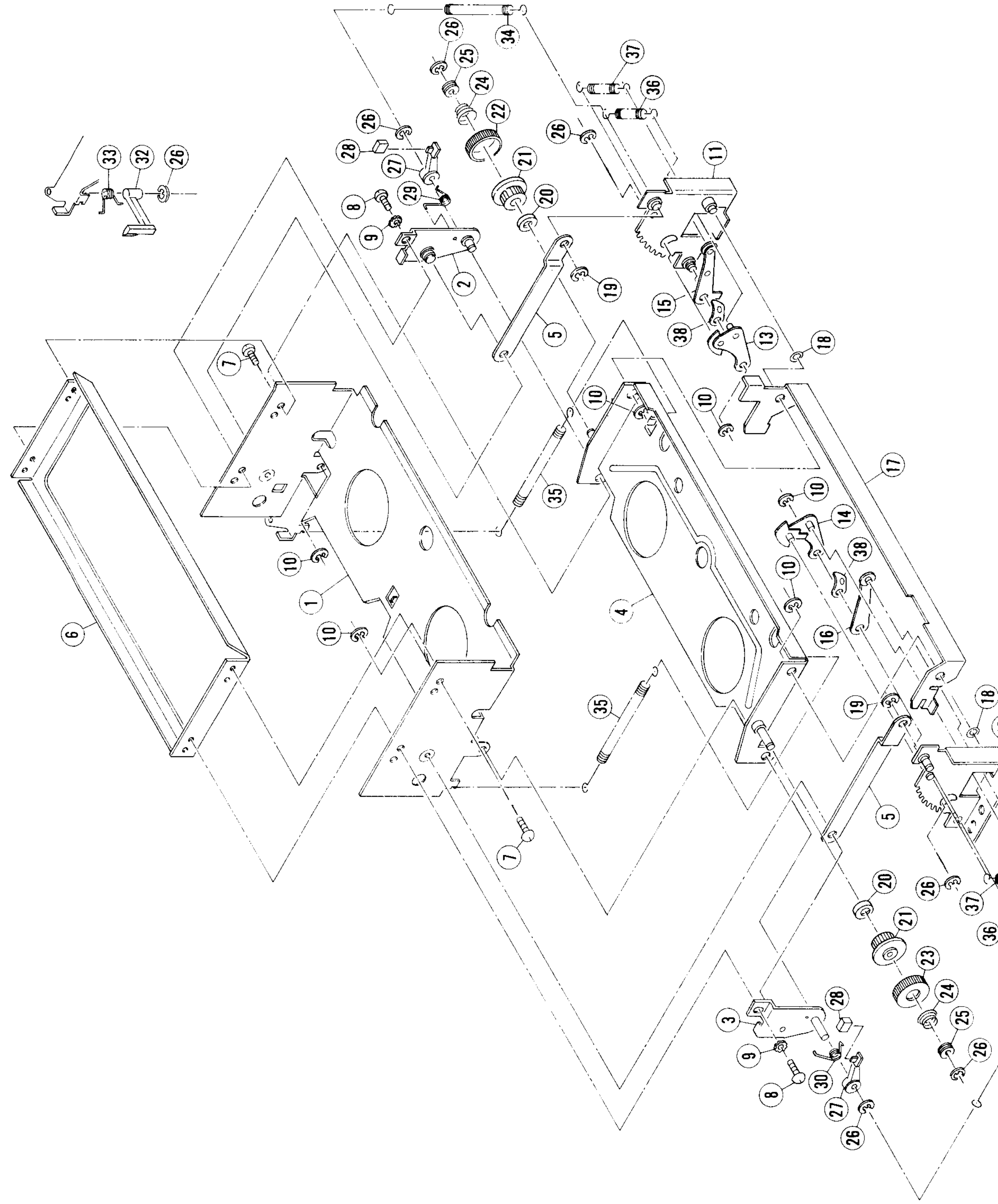
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU31332F-11	Upper Drum Ass'y		1
2	NDBP3010NS	Screw		2
3	PU49483	Commutator		1
4	PUS25978C	Lower Drum Ass'y		1
5	PU48700	Heater Ass'y		1
6	SDBP3004NS	Screw		2
7	PU48677	Bracket		1
8	DPSP3006ZS	Screw		3
9	PU48678A	Brush Ass'y		1
10	PU48679	Connector Circuit Board		1
11	PU49217-6	Receptacle Housing		1

7.9 CASSETTE HOUSING ASSEMBLY



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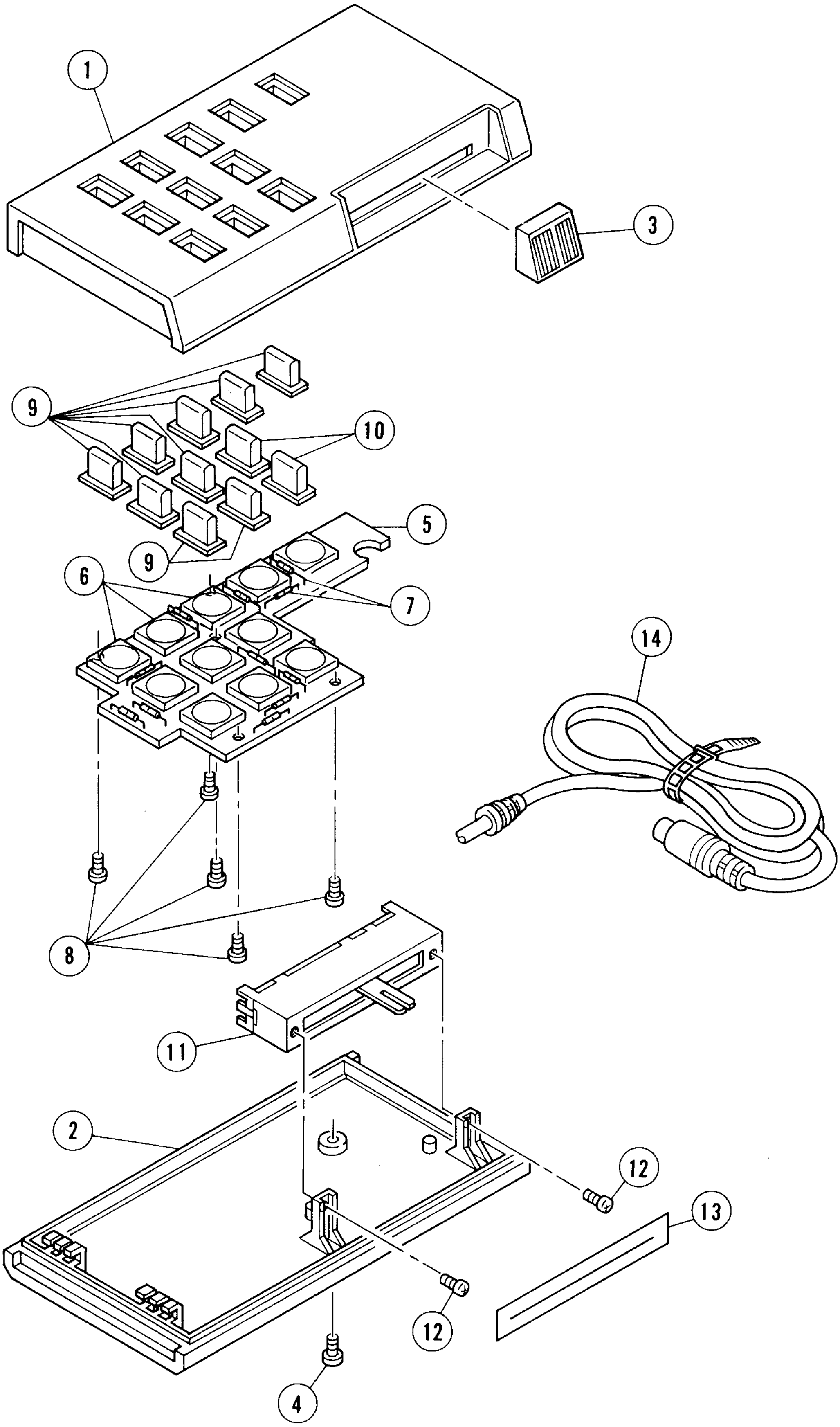
26

Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU32474A	Housing Sub-Ass'y		1
2	PU49102A	Lever Holder (1) Ass'y		1
3	PU49102B	" (2) "		1
4	PU32475A	Lever Plate Ass'y		1
5	PU49105	Lever		2
6	PU49104	Roof Plate		1
7	SBSE3008Z	Tapping Screw		2
8	SBSE3008Z	"		2
9	WBS3000Z	Lock Washer		2
10	REE3000	E-Ring		6
11	PU49100A	Stand (1) Ass'y		1
12	PU49100B	" (2) "		1
13	PU50172A	Hook Ass'y (R)		1
14	PU50172B	" (L)		1
15	PU50176A	Lever Ass'y (R)		1
16	PU50177A	" (L)		1
17	PU32756	Release Lever		1
18	Q03093-832	Washer		2
19	REE4000	E-Ring		2
20	PU50179	Roller		2
21	PU49111	Friction Plate		2
22	PU47767-1	Brake Drum (R)		1
23	" -2	" (L)		1
24	PU49124	Friction Spring		2
25	PU49112	Spring Roller		2
26	REE2500	E-Ring		7
27	PU49113	Rubber Holder		2
28	PU47763	Rubber Tire		2
29	PU49123-1	Torsion Spring (1)		1
30	" -2	" (2)		1
31	–	–		–
32	PU49114	Lid Opener		1
33	PU49502-1	Torsion Spring		1
34	PU49121	Lift Spring		2
35	PU49122	Hold Spring		2
36	PU35005-128	Spring		2
37	" -129	"		2
38	PU50264	Stopper		2
39	PUS25908-C	Cassette Housing Ass'y	Incl. (1) – (38)	1

7.10 REMOTE CONTROL UNIT ASSEMBLY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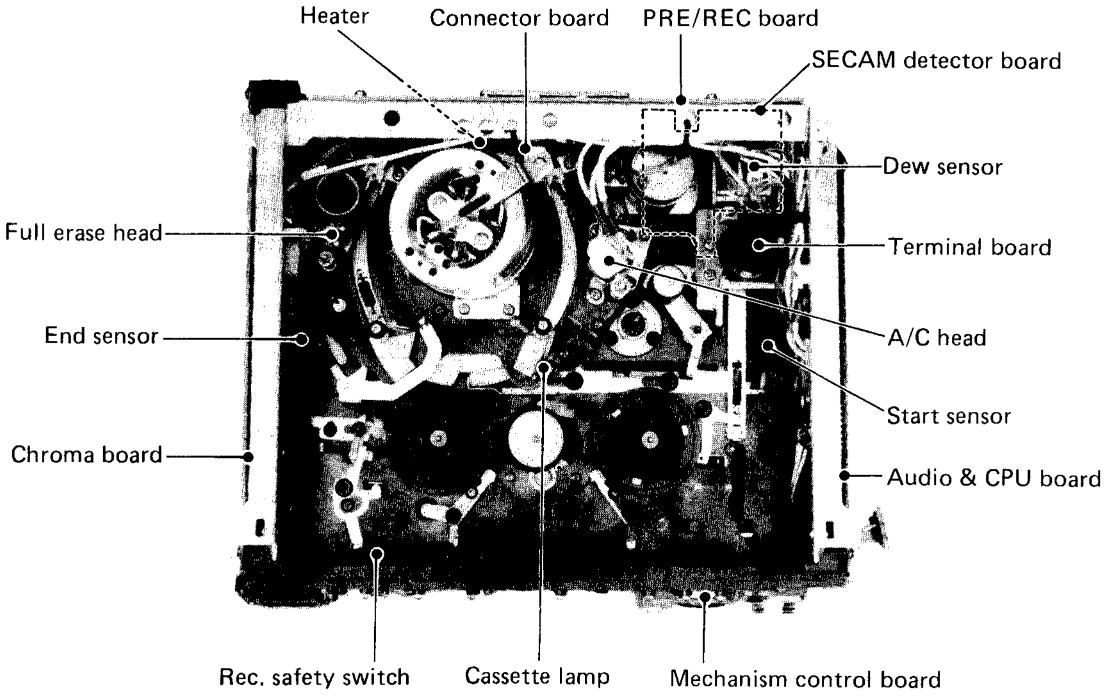
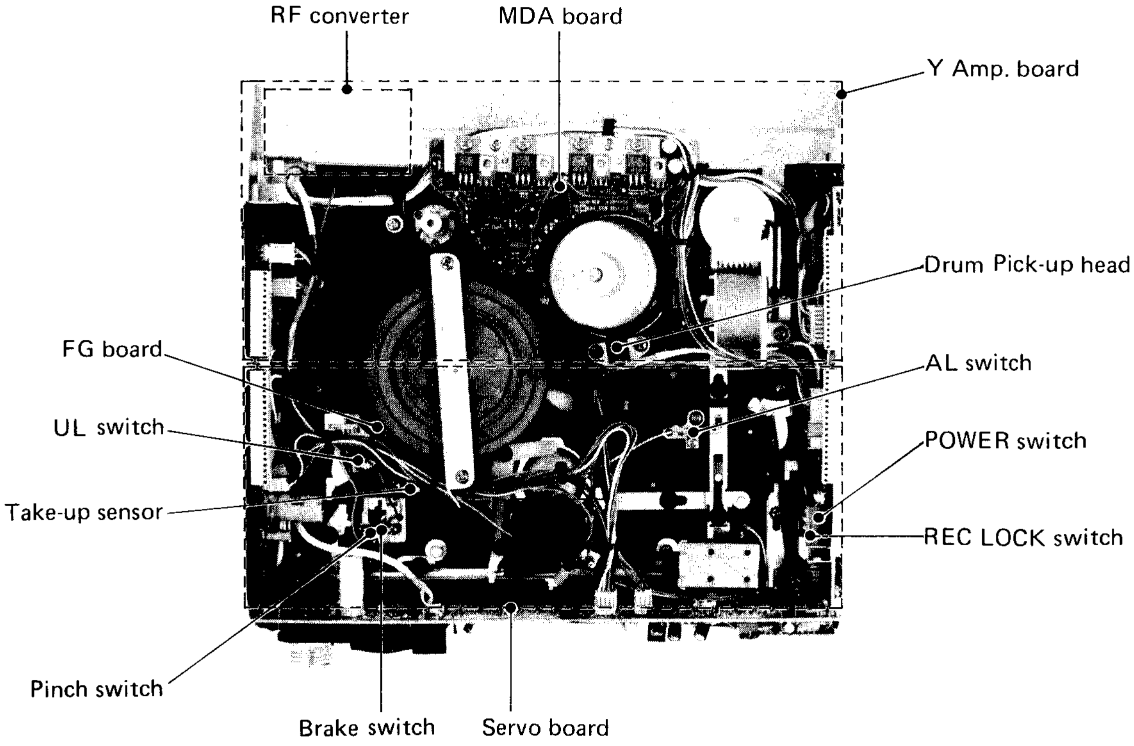
Symbol No.	Part No.	Part Name	Description	Q'ty
1	A2KH019A	Top Cover Ass'y		1
2	A1KH004A	Bottom Cover		1
3	38KH014A	VR Knob		1
4	CK72401A	Tapping Screw		1
5	12KH010A	Circuit Board		1
6	KHG10901	Push Switch		11
7	1S2075	Diode		11
8	3A031060	Tapping Screw		5
9	38KH002A	Button	Gray	9
10	38KH008A	Button	Red	2
11	4V05002A	Slide VR	470 K (B)	1
12	SPSP2004Z	Screw		2
13	25KH003A	Insulator		1
14	30KH001A	Cable Ass'y		1

SECTION 8
CHARTS AND DIAGRAMS

8.1 ELECTRICAL PARTS LOCATION


Heater
Connector board
PRE/REC board
SECAM detector board
Dew sensor
Full erase head
Terminal board
End sensor
A/C head
Start sensor
Chroma board
Audio & CPU board
Rec. safety switch
Cassette lamp
Mechanism control board

(a) Top view

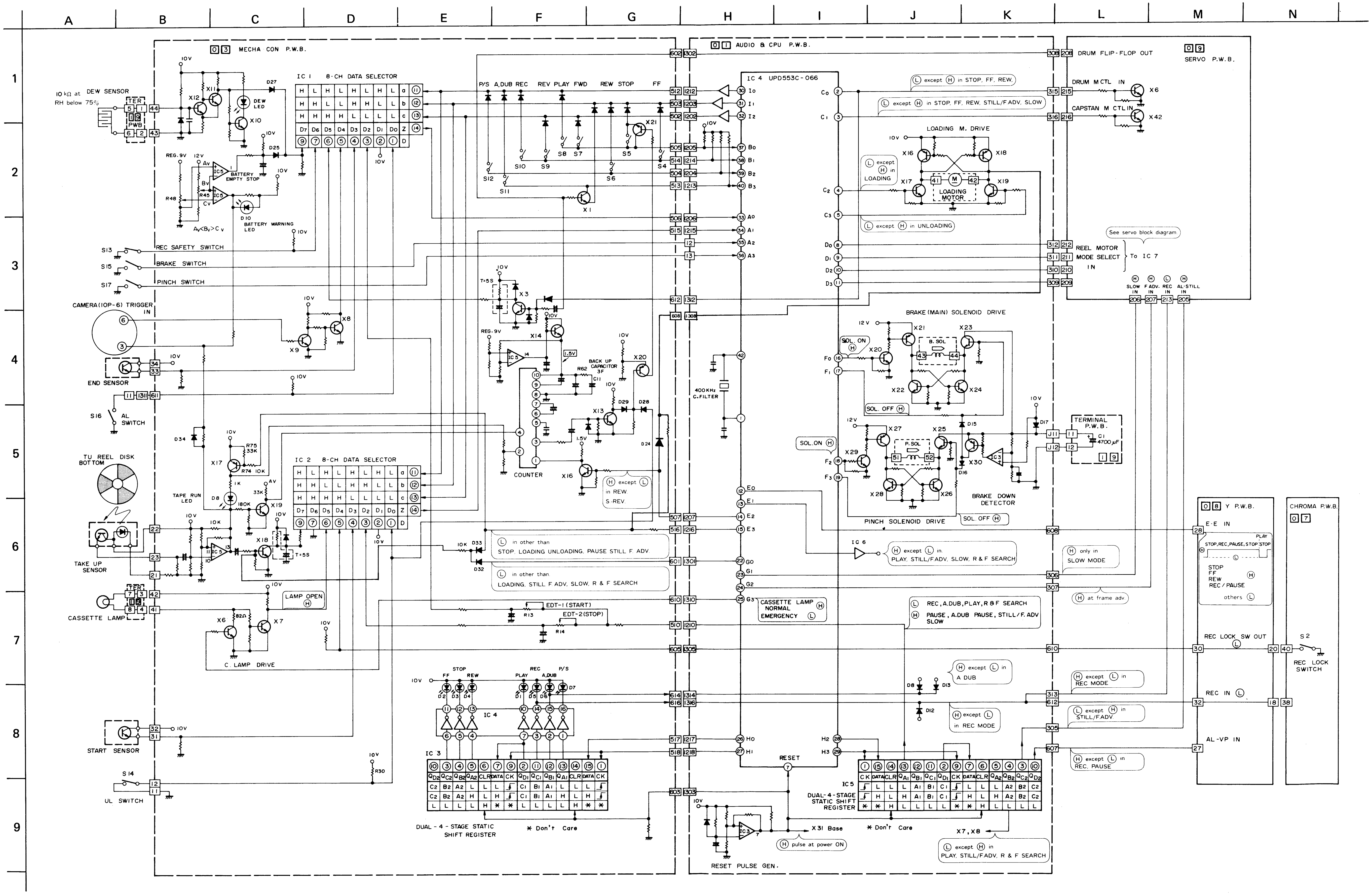

RF converter
MDA board
Y Amp. board
Drum Pick-up head
FG board
AL switch
UL switch
POWER switch
Take-up sensor
REC LOCK switch
Pinch switch
Brake switch
Servo board

(b) Bottom view

8.2 KEY TO ABBREVIATIONS

ACC : Automatic Color Control
A/C : Audio/Control
A.E. : Audio Erase
AFC : Automatic Frequency Control
AGC : Automatic Gain Control
AL : After Loading
AMP : Amplifier
AR : After Recording
BAL : Balance
BPF : Band-Pass Filter
C : Chrominance, Capstan
CAP. : Capstan
CASS. : Cassette
C.D. : Count Down
CH. : Channel
CONN. : Connector
CONV. : Converter
C. SIG. : Camera Signal
CTL. : Control
D. : Drum
DEMOD. : Demodulator
DET. : Detector
DL : Delay Line
DOC : Drop Out Compensator
EF : Emitter Follower
EQ : Equalizer
E.S. : End Sensor
E. SW : Electronic Switch
FE : Full Erase
FF IN : Flip-Flop Input
FG : Frequency Generator
FR : Full Recording
FWD : Forward
GEN : Generator
HPF : High-Pass Filter
INV : Inverter
LIM. : Limiter
LPF : Low-Pass Filter
MDA : Motor Drive Amplifier
MECHACON : Mechanism Control
MIC : Microphone
MM : Monostable Multivibrator
MOD. : Modulator
OPE. : Operation
OSC : Oscillator
P.B. : Playback
P/S : Pause/Still
P. TR. : Power Transistor
REG. : Regulator
REV. : Reverse
R/P : Record/Playback
R.T. : Rotary Transformer
RY : Relay
SENS. : Sensor
SF : Source Follower
SOL. : Solenoid
S.S. : Start Sensor
SW : Switch
SYNC SEP : Sync Separator
T. LEAD SW : Thermal Lead Switch
TR : Transistor
UL : Unloading
VCO : Voltage Controled Oscillator
VP. : Video Play
V. PULSE : Vertical Sync Pulse
VR : Variable Resistor
Y : Luminance

8.3 MECHANISM CONTROL BLOCK DIAGRAM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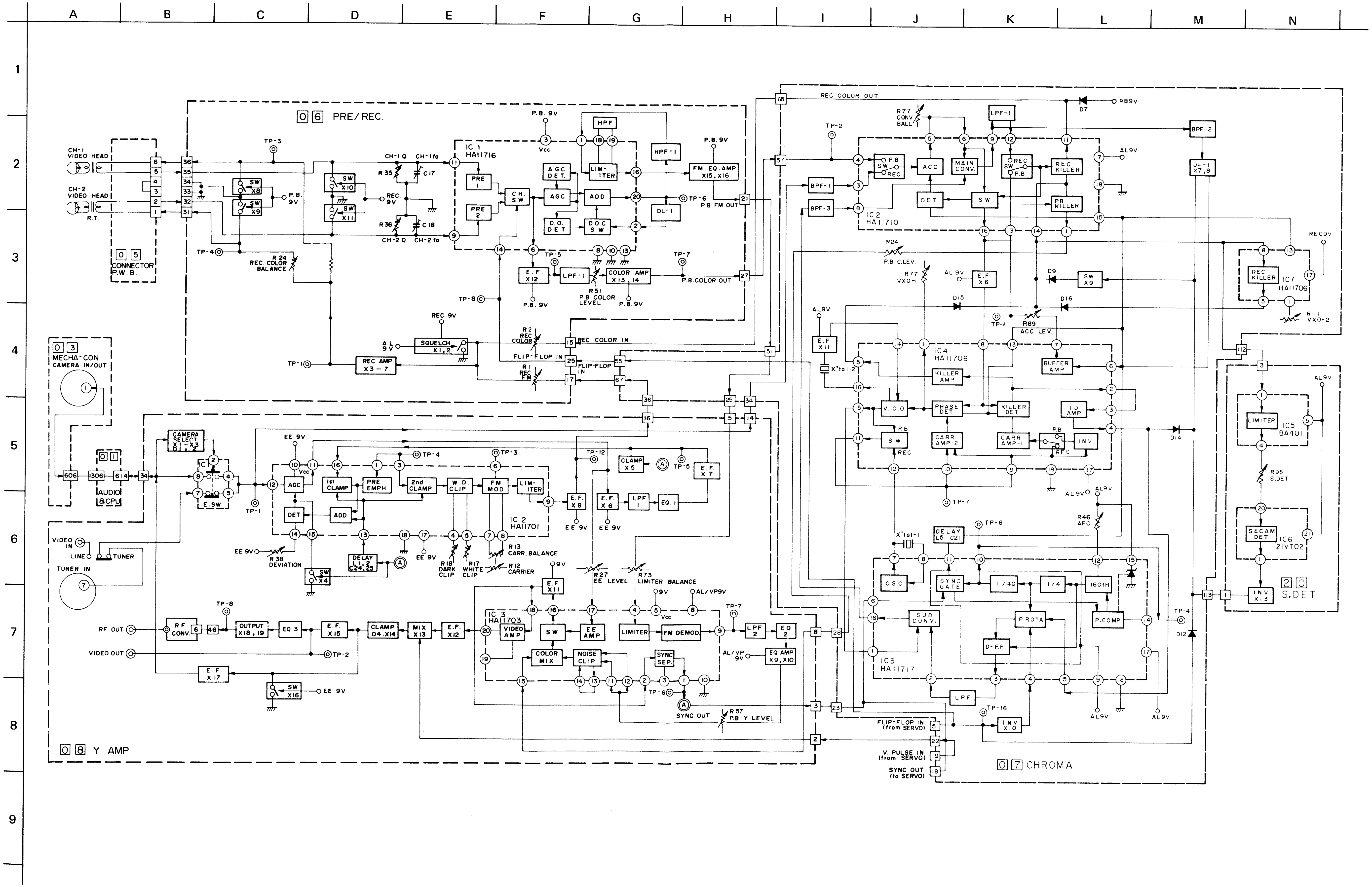
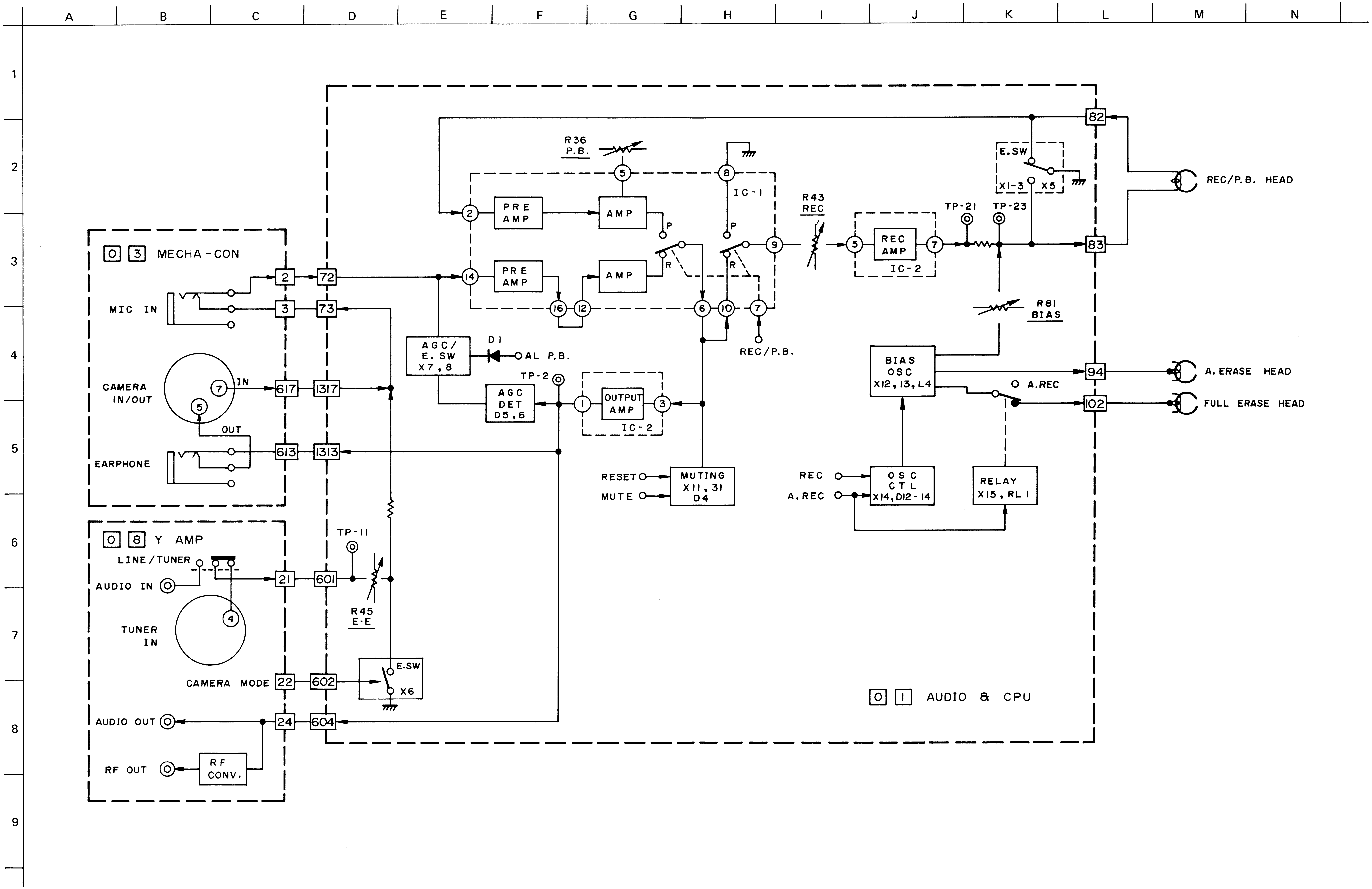
03 MECHA CON P.W.B.
01 AUDIO & CPU P.W.B.
09 SERVO P.W.B.
08 Y P.W.B.
CHROMA P.W.B. 07
10 kΩ at RH below 75%
DEW SENSOR
TER
PWB
X12
X11
DEW LED
X10
D27
D25
REG.9V
12V
Av
Bv
Cv
IC5
R45
R48
BATTERY EMPTY STOP
D10
BATTERY WARNING LED
Av<Bv>Cv
10V
IC 1 8-CH DATA SELECTOR
IC 2 8-CH DATA SELECTOR
D7 D6 D5 D4 D3 D2 D1 D0 Z
P/S A.DUB REC REV PLAY FWD REW STOP FF
S12 S11 S10 S9 S8 S7 S5 S6 S4
X21
X1
S13
REC SAFETY SWITCH
S15
BRAKE SWITCH
S17
PINCH SWITCH
CAMERA(10P-6) TRIGGER IN
X8
X9
END SENSOR
S16
AL SWITCH
T=5S
X3
X14
REG.9V
1.5V
R62
BACK UP CAPACITOR 3F
C11
X20
X13
D29
D28
D24
COUNTER
X16
(H) except (L) in REW S-REV
D34
TU REEL DISK BOTTOM
X17
R75 33K
R74 10K
TAPE RUN LED
D8
180K
X19
X18
TAKE UP SENSOR
10K
D33
D32
(L) in other than STOP, LOADING UNLOADING, PAUSE STILL F. ADV
(L) in other than LOADING, STILL F. ADV, SLOW, R & F SEARCH
CASSETTE LAMP
LAMP OPEN (H)
X6
82Ω
X7
C. LAMP DRIVE
EDT-1 (START)
EDT-2 (STOP)
R13
R14
STOP
FF
REW
PLAY
REC
A.DUB
P/S
D2 D3 D4 D1 D5 D6 D7
IC 4
IC 3
DUAL - 4 - STAGE STATIC SHIFT REGISTER
✱ Don't Care
START SENSOR
S14
UL SWITCH
R30
IC 4 UPD553C-066
I0 I1 I2
B0 B1 B2 B3
A0 A1 A2 A3
C0 C1 C2 C3
D0 D1 D2 D3
F0 F1 F2 F3
E0 E1 E2 E3
G0 G1 G2 G3
H0 H1 H2 H3
400KHz C.FILTER
RESET
RESET PULSE GEN.
X31 Base
(H) pulse at power ON
IC3
(L) except (H) in STOP, FF, REW.
(L) except (H) in STOP, FF, REW, STILL/F.ADV, SLOW
LOADING M. DRIVE
X16 X18 X17 X19
LOADING MOTOR
(L) except (H) in LOADING
(L) except (H) in UNLOADING
DRUM FLIP-FLOP OUT
DRUM M CTL IN
CAPSTAN M CTL IN
X6
X42
See servo block diagram
REEL MOTOR MODE SELECT IN
To IC 7
SLOW F.ADV. REC AL-STILL IN
BRAKE (MAIN) SOLENOID DRIVE
12V
SOL. ON (H)
X21 X23 X20 X22 X24
B. SOL
SOL. OFF (H)
X27 X25 X29 X28 X26 X30
P. SOL
D15 D16 D17
TERMINAL P.W.B.
C1 4700μF
BRAKE DOWN DETECTOR
PINCH SOLENOID DRIVE
IC 6
(H) except (L) in PLAY, STILL/F.ADV, SLOW, R & F SEARCH
(H) only in SLOW MODE
(H) at frame adv
CASSETTE LAMP NORMAL (H) EMERGENCY (L)
(L) REC, A.DUB, PLAY, R & F SEARCH
(H) PAUSE, A.DUB PAUSE, STILL/F.ADV SLOW
E-E IN
PLAY
STOP, REC, PAUSE, STOP STOP
STOP FF REW REC / PAUSE (H)
others (L)
REC LOCK SW OUT (L)
S2
REC LOCK SWITCH
REC IN (L)
AL-VP IN
(H) except (L) in A DUB
D8 D13 D12
(H) except (L) in REC MODE
(H) except (L) in REC MODE
(L) except (H) in STILL/F.ADV
(H) except (L) in REC. PAUSE
IC5
DUAL - 4 - STAGE STATIC SHIFT REGISTER
X7, X8
(L) except (H) in PLAY, STILL/F.ADV, R & F SEARCH

8.4 VIDEO SYSTEM BLOCK DIAGRAM


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
06 PRE/REC.
05 CONNECTOR P.W.B.
03 MECHA-CON CAMERA IN/OUT
01 AUDIO & CPU
08 Y AMP
07 CHROMA
20 S.DET
CH-1 VIDEO HEAD
CH-2 VIDEO HEAD
R.T.
SW X8
SW X9
SW X10
SW X11
P.B. 9V
REC. 9V
CH-1Q
CH-1fo
CH-2Q
CH-2fo
R35
C17
R36
C18
IC 1 HA11716
PRE 1
PRE 2
CH SW
AGC DET.
AGC
LIM-ITER
ADD
HPF
HPF-1
D.O. DET
DOC SW
DL-1
FM. EQ. AMP X15, X16
P.B FM OUT
E.F X12
LPF-1
COLOR AMP X13, 14
R51 P.B COLOR LEVEL
P.B.COLOR OUT
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8
TP-1
R24 REC COLOR BALANCE
SQUELCH X1, 2
REC AMP X3-7
REC 9V
A.L. 9V
R2 REC COLOR
R1 REC FM
REC COLOR IN
FLIP-FLOP IN
CAMERA SELECT X1-X3 D1, 2
E.SW
VIDEO IN
LINE
TUNER
TUNER IN
RF OUT
VIDEO OUT
EE 9V
AGC
DET
ADD
1st CLAMP
PRE EMPH.
2nd CLAMP
W.D. CLIP
FM MOD
LIM-ITER
IC 2 HA11701
R38 DEVIATION
DELAY L1, 2 C24, 25
SW X4
R18 DARK CLIP
R17 WHITE CLIP
R13 CARR. BALANCE
R12 CARRIER
E.F X8
E.F X6
LPF 1
EQ. 1
CLAMP X5
E.F X7
TP-12
R27 EE LEVEL
R73 LIMITER BALANCE
AL/VP9V
E.F. X11
IC 3 HA11703
VIDEO AMP
SW
EE AMP
LIMITER
FM DEMOD
COLOR MIX
NOISE CLIP
SYNC SEP.
SYNC OUT
R57 P.B. Y. LEVEL
LPF 2
EQ 2
EQ. AMP X9, X10
RF CONV.
OUTPUT X18, 19
EQ 3
E.F. X15
CLAMP D4. X14
MIX X13
E.F. X12
E.F X17
SW X16
REC COLOR OUT
PB9V
D7
R77 CONV BALL
LPF-1
BPF-2
DL-1 X7, 8
P.B SW REC
ACC
MAIN CONV.
REC SW P.B
REC KILLER
PB KILLER
DET
IC 2 HA11710
BPF-1
BPF-3
AL9V
REC9V
R24 P.B C.LEV.
R77 VXO-1
E.F X6
D9
SW X9
D15
D16
R89 ACC LEV.
REC KILLER
IC7 HA11706
R111 VXO-2
E.F X11
X'tal-2
IC4 HA11706
KILLER AMP
BUFFER AMP
V.C.O
PHASE DET
KILLER DET
I.D AMP
SW
CARR AMP-2
CARR AMP-1
INV
LIMITER
IC5 BA401
D14
R95 S.DET
SECAM DET
IC6 21VT02
INV X13
R46 AFC
X'tal-1
DELAY L5 C21
OSC
SYNC GATE
1/40
1/4
160fH
SUB CONV.
P.ROTA
P.COMP
D-FF
LPF
IC3 HA11717
TP-16
INV X10
D12
FLIP-FLOP IN (from SERVO)
V. PULSE IN (from SERVO)
SYNC OUT (to SERVO)

8.5 AUDIO SYSTEM BLOCK DIAGRAM



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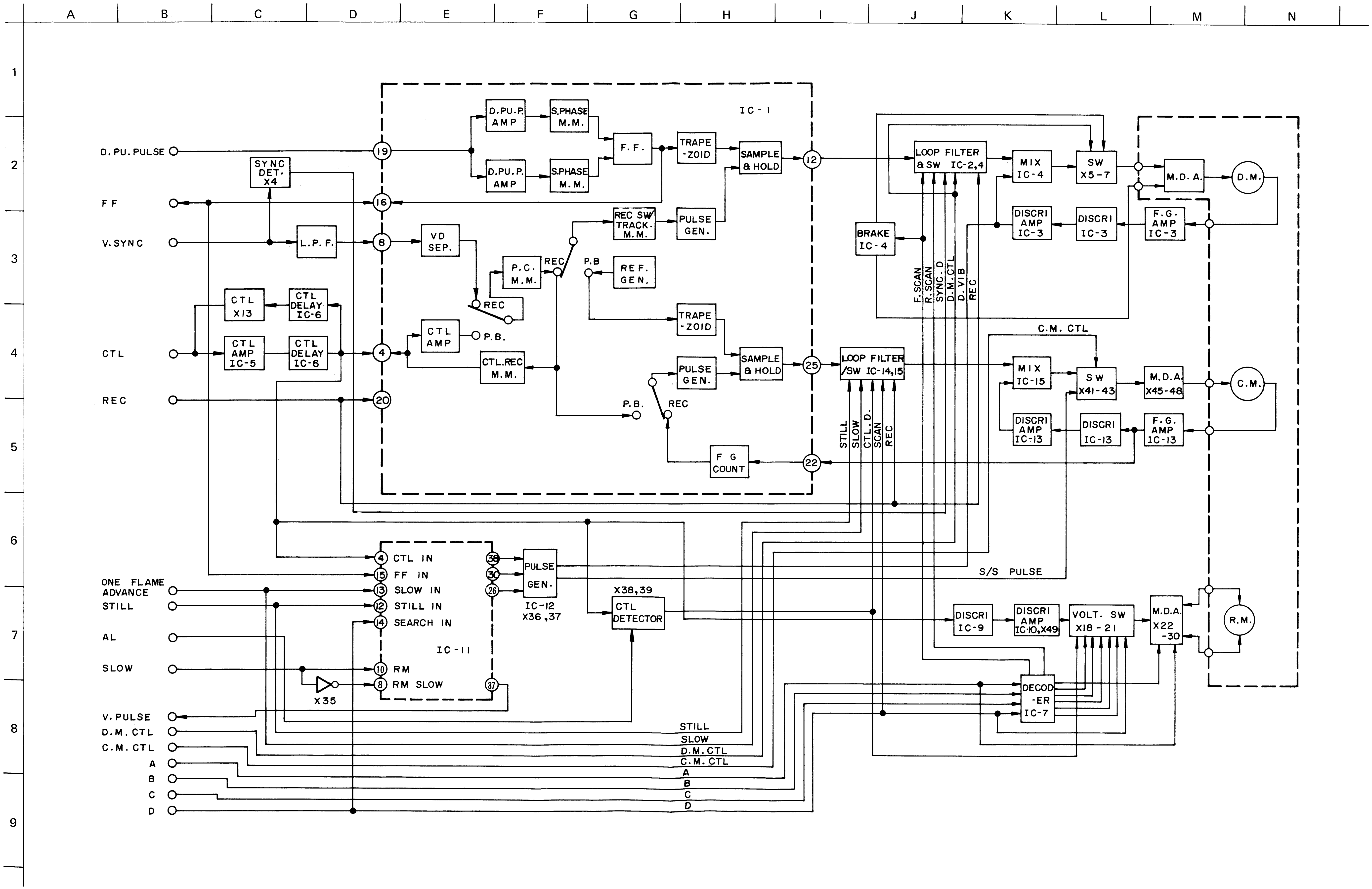
03 MECHA-CON
MIC IN
CAMERA IN/OUT
IN
OUT
EARPHONE
08 Y AMP
LINE/TUNER
AUDIO IN
TUNER IN
CAMERA MODE
AUDIO OUT
RF OUT
RF CONV.
2
3
617
613
21
22
24
72
73
1317
1313
601
602
604
TP-11
R45 E-E
E.SW
X6
AGC/ E. SW X7, 8
D1
AL P.B.
TP-2
AGC DET D5, 6
OUTPUT AMP
IC-2
R36 P.B.
PRE AMP
AMP
PRE AMP
AMP
IC-1
P
R
REC/P.B.
R43 REC
REC AMP
IC-2
TP-21
TP-23
R81 BIAS
E.SW
X1-3
X5
82
83
94
102
REC/P.B. HEAD
A. ERASE HEAD
FULL ERASE HEAD
BIAS OSC X12, 13, L4
A.REC
OSC CTL X14, D12-14
RELAY X15, RL1
REC
A.REC
RESET
MUTE
MUTING X11, 31 D4
01 AUDIO & CPU

8.6 SERVO BLOCK DIAGRAM-(1)


A
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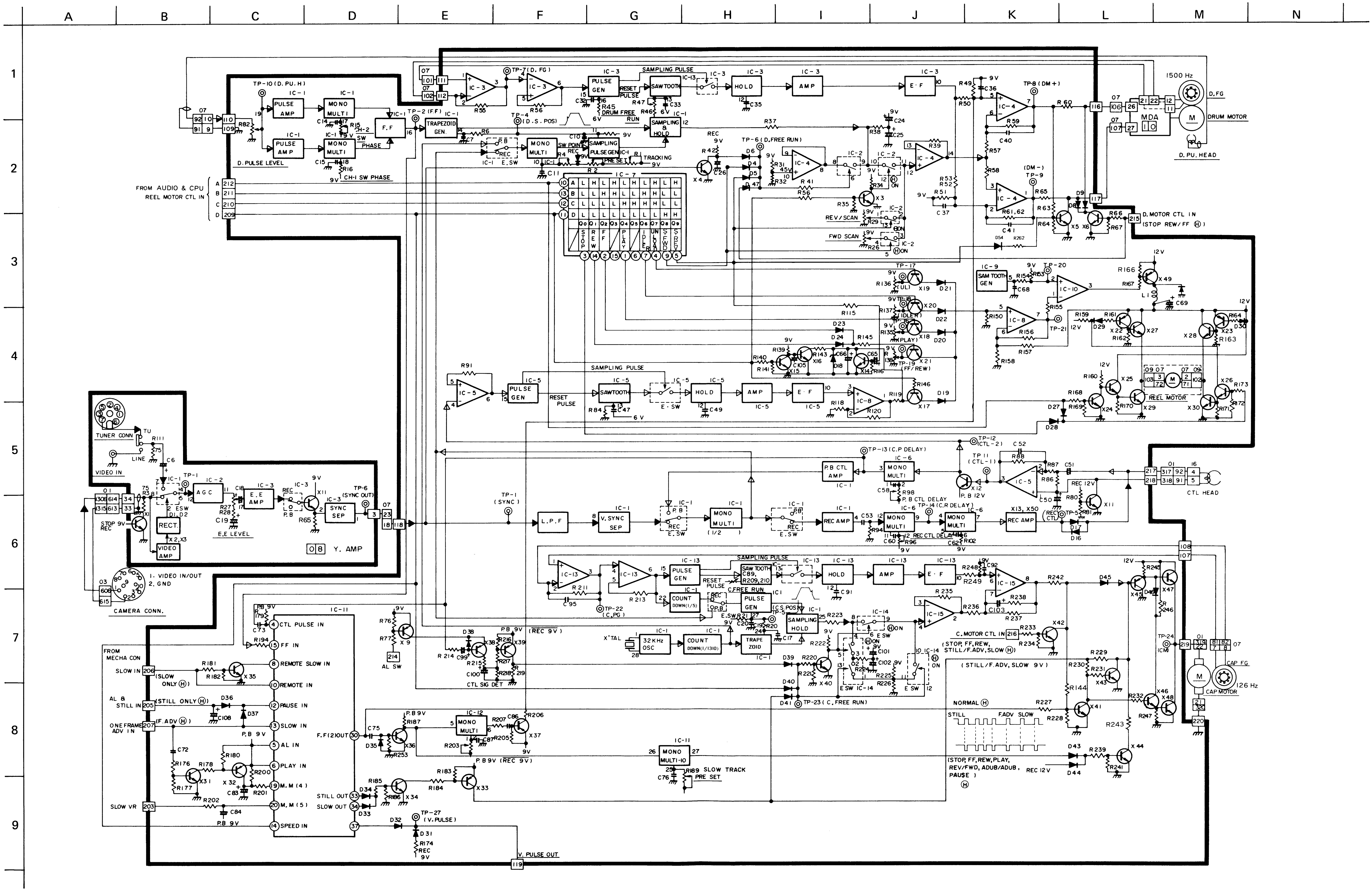
9
IC - I
D.PU.P. AMP
S.PHASE M.M.
D.PU.P. AMP
S.PHASE M.M.
F. F.
TRAPE -ZOID
SAMPLE & HOLD
D. PU. PULSE
SYNC DET. X4
19
12
FF
16
V. SYNC
L.P.F.
8
VD SEP.
REC SW TRACK. M.M.
PULSE GEN.
P.C. M.M.
REC
P.B
REF. GEN.
REC
CTL X13
CTL DELAY IC-6
TRAPE -ZOID
CTL
CTL AMP IC-5
CTL DELAY IC-6
4
CTL AMP
P.B.
CTL.REC M.M.
PULSE GEN.
SAMPLE & HOLD
25
REC
20
P.B.
REC
F G COUNT
22
LOOP FILTER & SW IC-2,4
MIX IC-4
SW X5-7
M.D.A.
D.M.
BRAKE IC-4
DISCRI AMP IC-3
DISCRI IC-3
F.G. AMP IC-3
F.SCAN
R.SCAN
SYNC. D
D.M.CTL
D.VIB
REC
C.M. CTL
LOOP FILTER /SW IC-14,15
MIX IC-15
SW X41-43
M.D.A. X45-48
C.M.
STILL
SLOW
CTL.D.
SCAN
REC
DISCRI AMP IC-13
DISCRI IC-13
F.G. AMP IC-13
4 CTL IN
15 FF IN
13 SLOW IN
12 STILL IN
14 SEARCH IN
IC-11
10 RM
8 RM SLOW
37
36
30
26
PULSE GEN.
IC-12 X36,37
X38,39
CTL DETECTOR
S/S PULSE
ONE FLAME ADVANCE
STILL
AL
SLOW
X35
DISCRI IC-9
DISCRI AMP IC-10,X49
VOLT. SW X18 - 21
M.D.A. X22 -30
R.M.
DECOD -ER IC-7
V. PULSE
D.M. CTL
C.M. CTL
A
B
C
D
STILL
SLOW
D.M.CTL
C.M.CTL
A
B
C
D

8.7 SERVO BLOCK DIAGRAM-(2)



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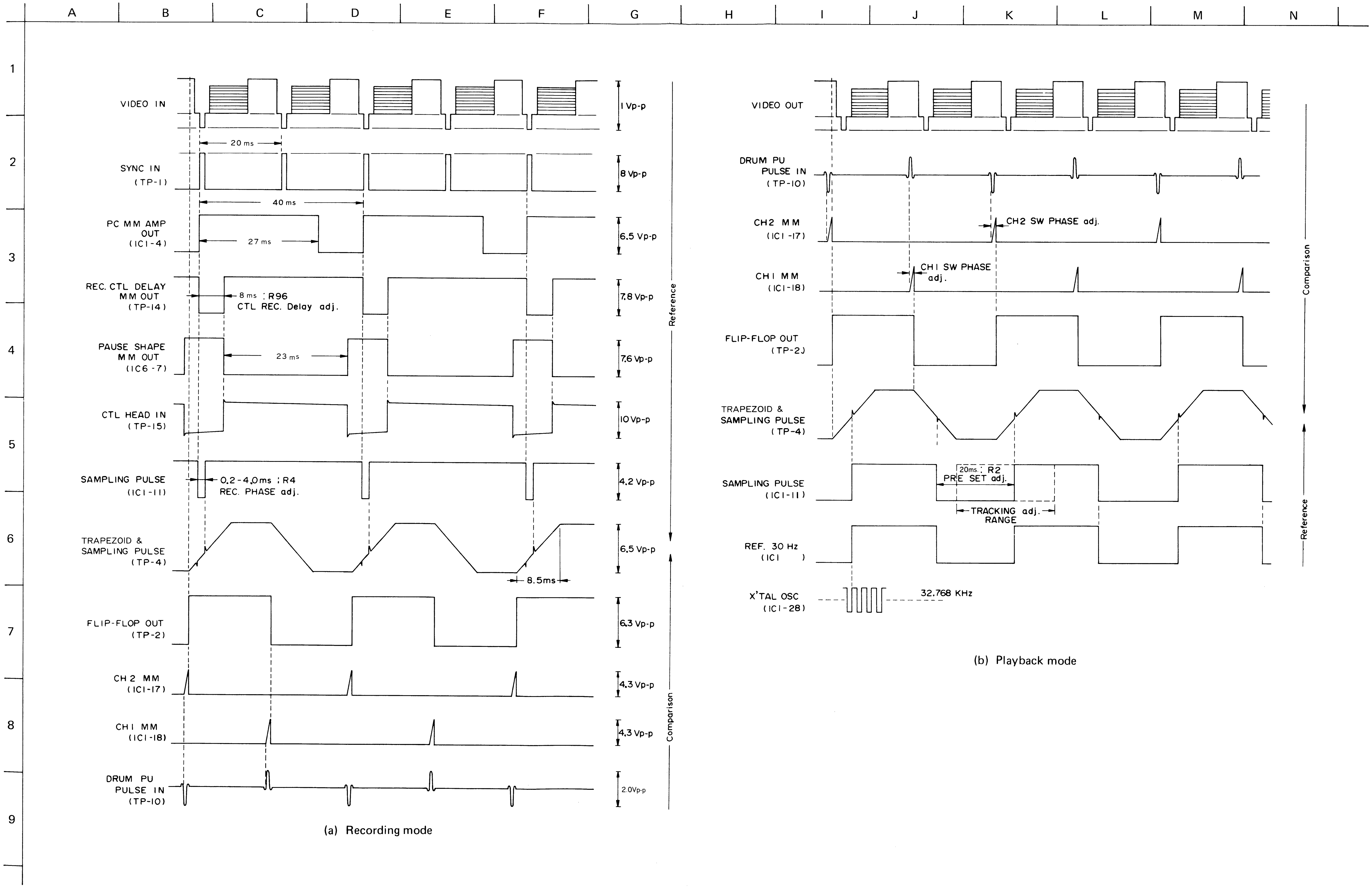
TP-10 (D. PU. H)
PULSE AMP
MONO MULTI
F. F
TRAPEZOID GEN.
TP-2 (F.F)
TP-7 (D. FG)
IC-3
PULSE GEN
SAMPLING PULSE
SAWTOOTH
HOLD
AMP
E · F
TP-8 (DM +)
TP-4 (D.S. POS)
DRUM FREE RUN
SAMPLING & HOLD
SAMPLING PULSE GEN
SW POINT
PRE SET
TRACKING
D. PULSE LEVEL
CH-1 SW PHASE
FROM AUDIO & CPU
REEL MOTOR CTL IN
IC-7
STOP
SFF REW
PLAY
IDLER
TP-6 (D.FREE RUN)
REV/SCAN
FWD SCAN
(DM -) TP-9
1500 Hz
D. FG
DRUM MOTOR
MDA
D. PU. HEAD
D. MOTOR CTL IN
(STOP REW/FF Ⓗ)
TP-17
TP-20
SAM TOOTH GEN
IC-9
IC-10
IC-8
TP-21
TP-19 (FF/REW)
REEL MOTOR
SAMPLING PULSE
IC-5
RESET PULSE
E · SW
TUNER CONN
TU
LINE
VIDEO IN
AGC
E. E AMP
E.E LEVEL
SYNC SEP
TP-6 (SYNC OUT)
RECT.
VIDEO AMP
Y. AMP
STOP 9V REC
1. VIDEO IN/OUT
2. GND
CAMERA CONN.
TP-1 (SYNC)
L. P. F
V. SYNC SEP
REC
P.B
MONO MULTI (1/2)
REC AMP
TP-13 (C.P DELAY)
P.B CTL AMP
IC-6
P. B CTL DELAY
TP-14 (C.R DELAY)
REC CTL DELAY
TP-12 (CTL-2)
TP 11 (CTL-1)
CTL HEAD
IC-13
COUNT DOWN (1/5)
TP-22 (C. PG)
C.FREE RUN
TP-5 (C.S POS)
X'TAL
32 KHz OSC
COUNT DOWN (1/1310)
TRAPE ZOID
IC-14
IC-15
E SW
C. MOTOR CTL IN
(STOP, FF, REW, STILL/F.ADV, SLOW Ⓗ)
(STILL/F.ADV, SLOW 9V)
NORMAL Ⓗ
STILL
F.ADV
SLOW
(STOP, FF, REW, PLAY, REV/FWD, ADUB/ADUB, PAUSE) Ⓗ
REC 12V
TP-24 (CM)
CAP FG
CAP MOTOR
126 Hz
TP-23 (C. FREE RUN)
IC-11
CTL PULSE IN
FF IN
REMOTE SLOW IN
REMOTE IN
PAUSE IN
SLOW IN
AL IN
PLAY IN
M.M (4)
M.M (5)
SPEED IN
FROM MECHA CON
SLOW IN
(SLOW ONLY Ⓗ)
AL & STILL IN
(STILL ONLY Ⓗ)
ONE FRAME ADV IN
(F.ADV Ⓗ)
SLOW VR
P.B 9V
F.F (2) OUT
STILL OUT
SLOW OUT
AL SW
CTL SIG DET
IC-12
MONO MULTI-10
SLOW TRACK PRE SET
TP-27 (V. PULSE)
V. PULSE OUT

SERVO BLOCK-(2) 8-7
(DRUM SERVO TIMING)

8-7 **SERVO BLOCK-(2)**
(DRUM SERVO TIMING)

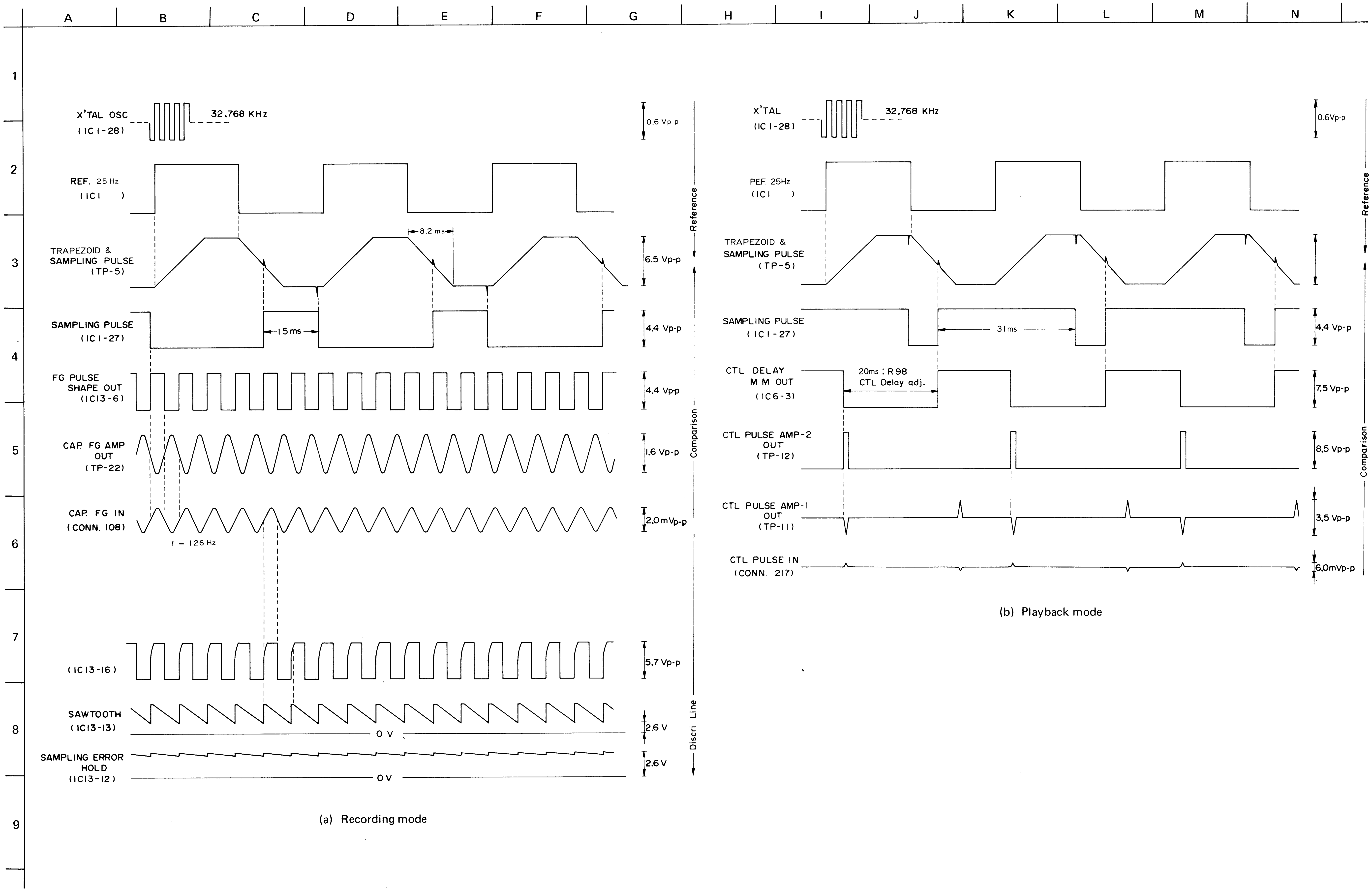
8.8 DRUM SERVO TIMING CHART



(a) Recording mode

(b) Playback mode

8.9 CAPSTAN SERVO TIMING CHART


A
B
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D
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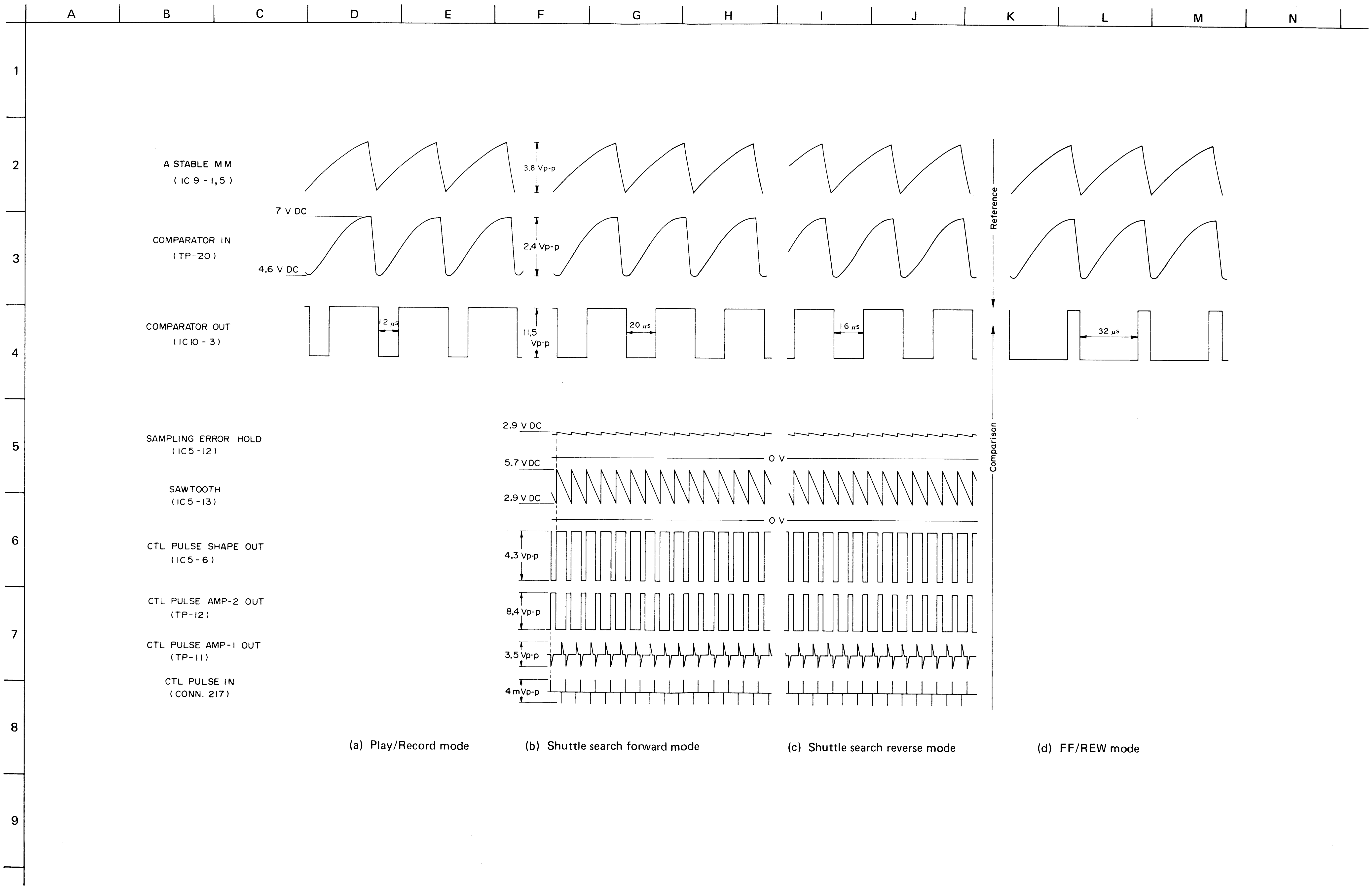
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
X'TAL OSC (IC 1-28)
32.768 KHz
0.6 Vp-p
REF. 25 Hz (IC1)
TRAPEZOID & SAMPLING PULSE (TP-5)
8.2 ms
6.5 Vp-p
SAMPLING PULSE (IC 1-27)
15 ms
4.4 Vp-p
FG PULSE SHAPE OUT (IC13-6)
4.4 Vp-p
CAP. FG AMP OUT (TP-22)
1.6 Vp-p
CAP. FG IN (CONN. 108)
2.0mVp-p
f = 126 Hz
(IC13-16)
5.7 Vp-p
SAWTOOTH (IC13-13)
0 V
2.6 V
SAMPLING ERROR HOLD (IC13-12)
0 V
2.6 V
Reference
Comparison
Discri Line
X'TAL (IC 1-28)
32.768 KHz
0.6Vp-p
PEF. 25Hz (IC1)
TRAPEZOID & SAMPLING PULSE (TP-5)
SAMPLING PULSE (IC 1-27)
31ms
4.4 Vp-p
CTL DELAY M M OUT (IC6-3)
20ms : R98 CTL Delay adj.
7.5 Vp-p
CTL PULSE AMP-2 OUT (TP-12)
8.5 Vp-p
CTL PULSE AMP-1 OUT (TP-11)
3.5 Vp-p
CTL PULSE IN (CONN. 217)
6.0mVp-p
Reference
Comparison

(b) Playback mode

(a) Recording mode

8.10 REEL SERVO TIMING CHART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1
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7
8
9
A STABLE MM
(IC 9-1,5)
7 V DC
COMPARATOR IN
(TP-20)
4.6 V DC
COMPARATOR OUT
(IC10-3)
3.8 Vp-p
2.4 Vp-p
11.5 Vp-p
12 μs
20 μs
16 μs
32 μs
Reference
Comparison
SAMPLING ERROR HOLD
(IC5-12)
2.9 V DC
5.7 V DC
0 V
SAWTOOTH
(IC5-13)
2.9 V DC
0 V
CTL PULSE SHAPE OUT
(IC5-6)
4.3 Vp-p
CTL PULSE AMP-2 OUT
(TP-12)
8.4 Vp-p
CTL PULSE AMP-1 OUT
(TP-11)
3.5 Vp-p
CTL PULSE IN
(CONN. 217)
4 mVp-p

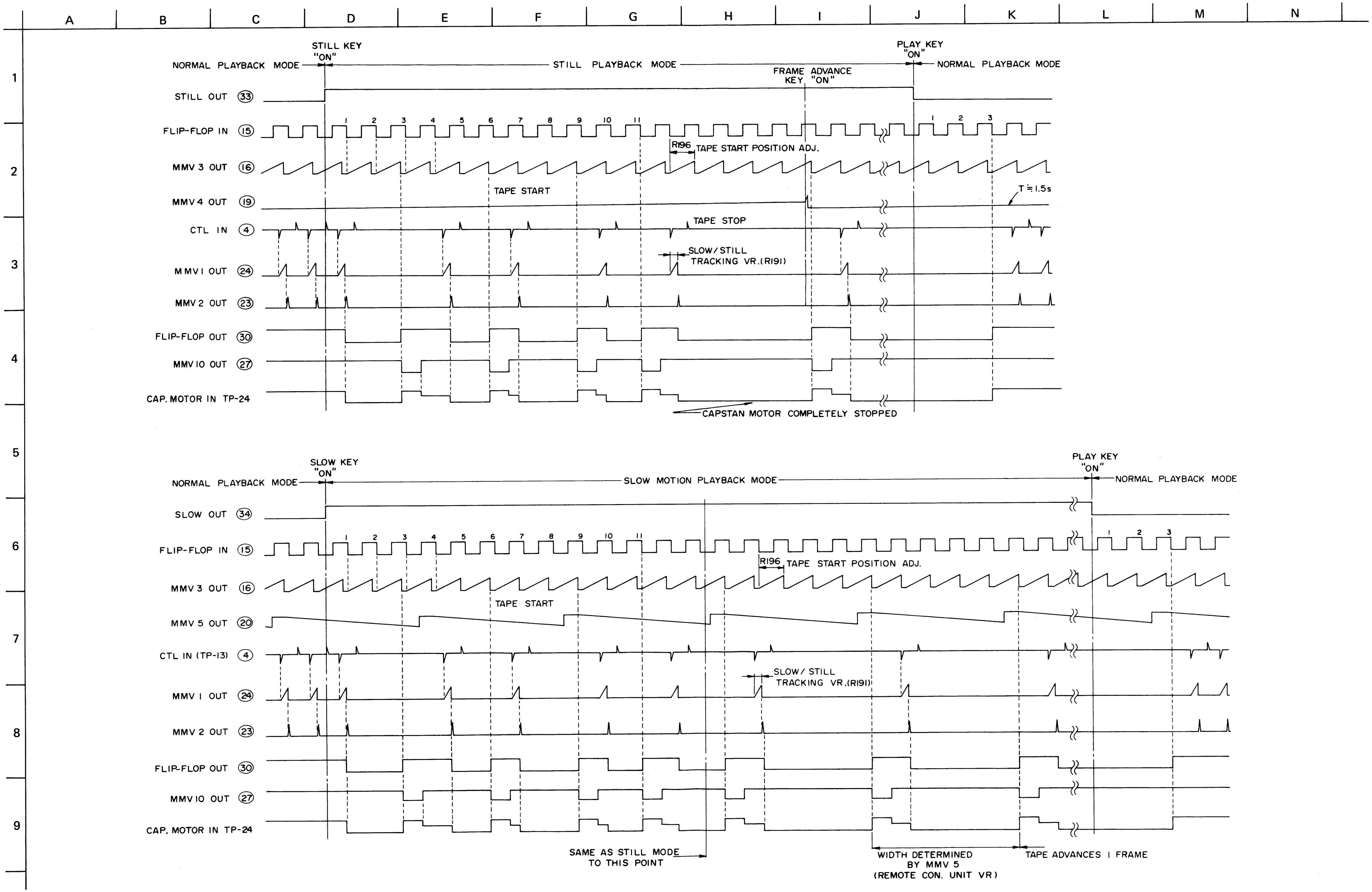
(a) Play/Record mode

(b) Shuttle search forward mode

(c) Shuttle search reverse mode

(d) FF/REW mode

8.11 SLOW/STILL TIMING CHART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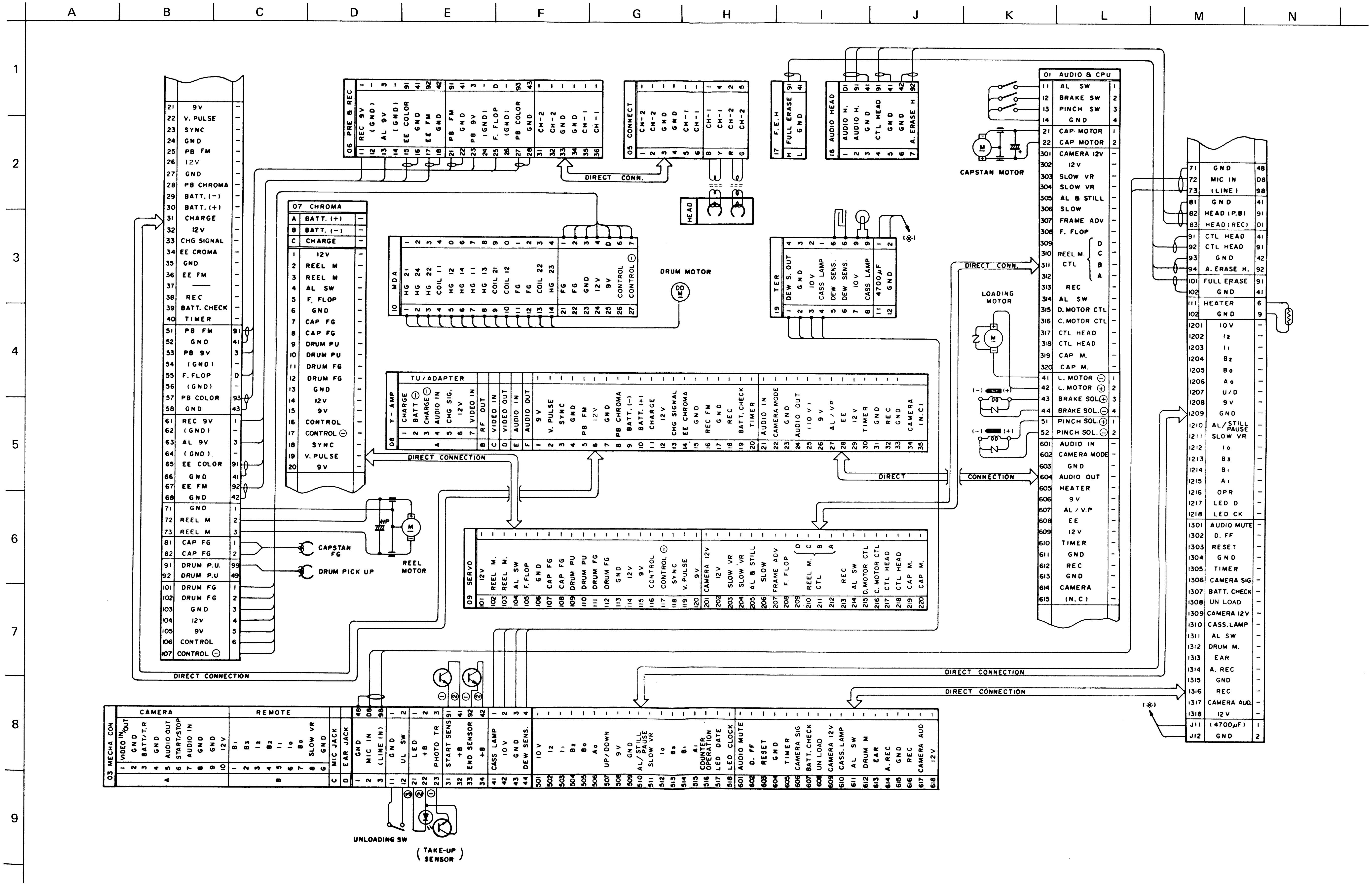
7
8
9
STILL KEY "ON"
NORMAL PLAYBACK MODE
STILL PLAYBACK MODE
FRAME ADVANCE KEY "ON"
PLAY KEY "ON"
NORMAL PLAYBACK MODE
STILL OUT ㉝
FLIP-FLOP IN ⑮
MMV 3 OUT ⑯
MMV 4 OUT ⑲
CTL IN ④
MMV 1 OUT ㉔
MMV 2 OUT ㉓
FLIP-FLOP OUT ㉚
MMV 10 OUT ㉗
CAP. MOTOR IN TP-24
1 2 3 4 5 6 7 8 9 10 11
1 2 3
R196 TAPE START POSITION ADJ.
TAPE START
T ≒ 1.5s
TAPE STOP
SLOW/STILL TRACKING VR.(R191)
CAPSTAN MOTOR COMPLETELY STOPPED
SLOW KEY "ON"
NORMAL PLAYBACK MODE
SLOW MOTION PLAYBACK MODE
PLAY KEY "ON"
NORMAL PLAYBACK MODE
SLOW OUT ㉞
FLIP-FLOP IN ⑮
MMV 3 OUT ⑯
MMV 5 OUT ⑳
CTL IN (TP-13) ④
MMV 1 OUT ㉔
MMV 2 OUT ㉓
FLIP-FLOP OUT ㉚
MMV 10 OUT ㉗
CAP. MOTOR IN TP-24
1 2 3 4 5 6 7 8 9 10 11
1 2 3
R196 TAPE START POSITION ADJ.
TAPE START
SLOW/ STILL TRACKING VR.(R191)
SAME AS STILL MODE TO THIS POINT
WIDTH DETERMINED BY MMV 5 (REMOTE CON. UNIT VR)
TAPE ADVANCES 1 FRAME

SLOW/STILL TIMING 8-11
(OVERALL WIRING)

8-11 **SLOW/STILL TIMING**
(OVERALL WIRING)

8.12 OVERALL WIRING DIAGRAM



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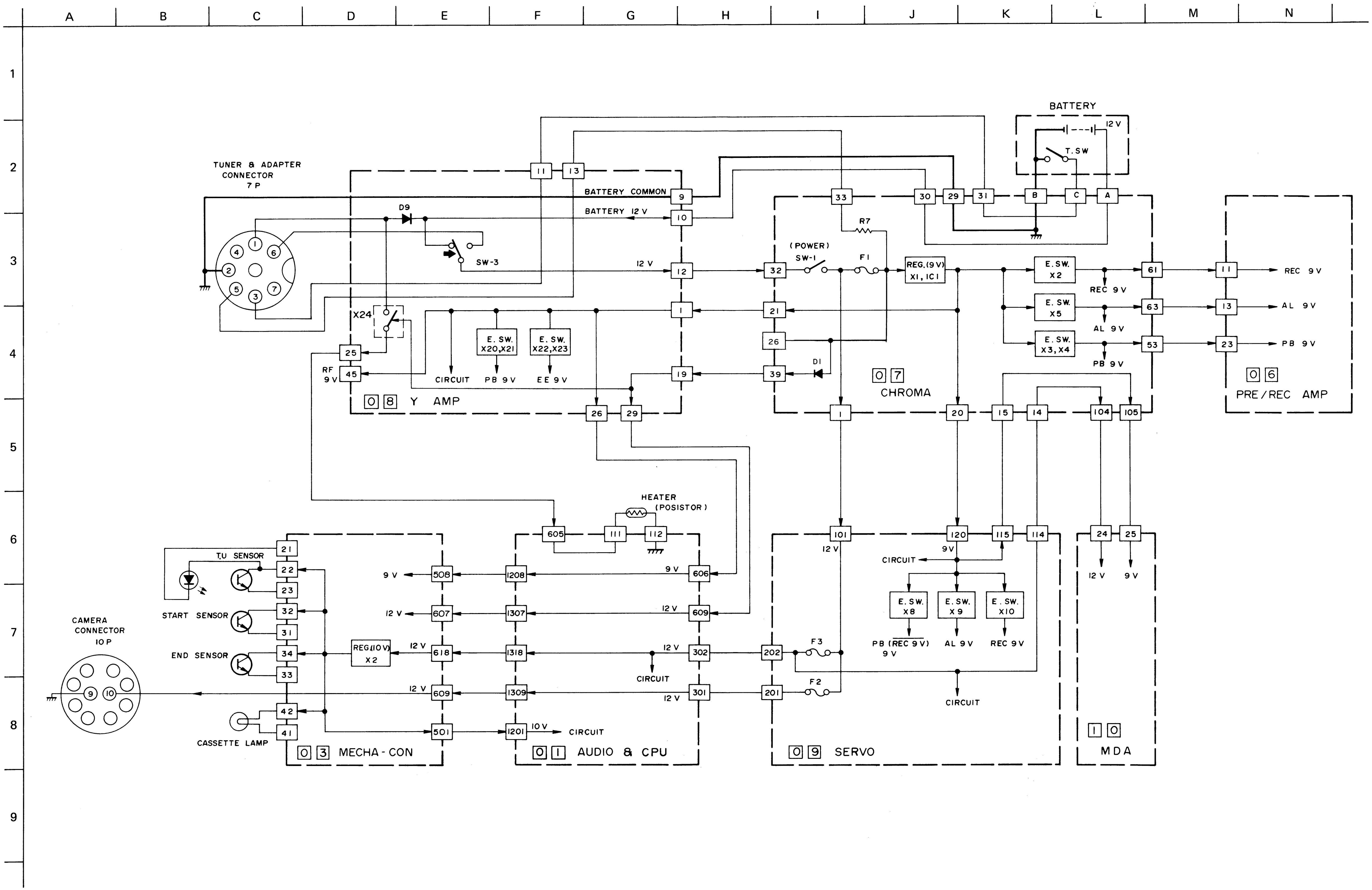
6
7
8
9
06 PRE & REC
REC 9V
(GND)
AL 9V
(GND)
EE COLOR
GND
EE FM
GND
PB FM
GND
PB 9V
(GND)
F. FLOP
(GND)
PB COLOR
GND
CH-2
CH-2
GND
GND
CH-1
CH-1
05 CONNECT
DIRECT CONN.
17 F.E.H
FULL ERASE
GND
16 AUDIO HEAD
AUDIO H.
AUDIO H.
GND
CTL HEAD
GND
A. ERASE H
HEAD
07 CHROMA
BATT. (+)
BATT. (−)
CHARGE
12V
REEL M
REEL M
AL SW
F. FLOP
GND
CAP FG
CAP FG
DRUM PU
DRUM PU
DRUM FG
DRUM FG
GND
12V
9V
CONTROL
CONTROL ⊖
SYNC
V. PULSE
9V
10 MDA
HG 21
HG 24
HG 22
COIL 11
HG 11
HG 14
HG 13
COIL 21
COIL 12
FG
COIL 22
HG 23
FG
FG
GND
12V
9V
CONTROL
CONTROL ⊖
DRUM MOTOR
19 TER
DEW S. OUT
GND
10V
CASS LAMP
DEW SENS.
DEW SENS.
10V
CASS LAMP
4700μF
GND
(※)
DIRECT CONN.
LOADING MOTOR
CAPSTAN MOTOR
01 AUDIO & CPU
AL SW
BRAKE SW
PINCH SW
GND
CAP. MOTOR
CAP MOTOR
CAMERA 12V
12V
SLOW VR
SLOW VR
AL & STILL
SLOW
FRAME ADV
F. FLOP
REEL M.
CTL
D
C
B
A
REC
AL SW
D. MOTOR CTL
C. MOTOR CTL
CTL HEAD
CTL HEAD
CAP M.
CAP M.
L. MOTOR ⊖
L. MOTOR ⊕
BRAKE SOL.⊕
BRAKE SOL.⊖
PINCH SOL.⊕
PINCH SOL.⊖
AUDIO IN
CAMERA MODE
GND
AUDIO OUT
HEATER
9V
AL / V.P
EE
12V
TIMER
GND
REC
GND
CAMERA
(N.C)
08 Y-AMP
TU/ADAPTER
CHARGE
BATT ⊖
CHARGE ⊖
AUDIO IN
CHG SIG.
12V
VIDEO IN
RF OUT
VIDEO IN
VIDEO OUT
AUDIO IN
AUDIO OUT
9V
V. PULSE
SYNC
GND
PB FM
12V
GND
PB CHROMA
BATT. (−)
BATT. (+)
CHARGE
12V
CHG SIGNAL
EE CHROMA
GND
REC FM
GND
REC
BATT. CHECK
TIMER
AUDIO IN
CAMERA MODE
GND
AUDIO OUT
(10V)
9V
AL / VP
EE
12V
TIMER
GND
REC
GND
CAMERA
(N.C)
DIRECT CONNECTION
DIRECT
CONNECTION
09 SERVO
12V
REEL M.
REEL M.
AL SW
F. FLOP
GND
CAP FG
CAP FG
DRUM PU
DRUM PU
DRUM FG
DRUM FG
GND
12V
9V
CONTROL
CONTROL ⊖
SYNC
V. PULSE
9V
CAMERA 12V
12V
SLOW VR
AL & STILL
SLOW
FRAME ADV
F. FLOP
REEL M.
CTL
REC
AL SW
D. MOTOR CTL
C. MOTOR CTL
CTL HEAD
CTL HEAD
CAP M.
CAP M.
9V
V. PULSE
SYNC
GND
PB FM
12V
GND
PB CHROMA
BATT. (−)
BATT. (+)
CHARGE
12V
CHG SIGNAL
EE CROMA
GND
EE FM
REC
BATT. CHECK
TIMER
PB FM
GND
PB 9V
(GND)
F. FLOP
(GND)
PB COLOR
GND
REC 9V
(GND)
AL 9V
(GND)
EE COLOR
GND
EE FM
GND
GND
REEL M
REEL M
CAP FG
CAP FG
DRUM P.U.
DRUM P.U
DRUM FG
DRUM FG
GND
12V
9V
CONTROL
CONTROL ⊖
CAPSTAN FG
DRUM PICK UP
REEL MOTOR
NP
DIRECT CONNECTION
GND
MIC IN
(LINE)
GND
HEAD (P.B)
HEAD (REC)
CTL HEAD
CTL HEAD
GND
A. ERASE H.
FULL ERASE
GND
HEATER
GND
10V
I2
I1
B2
B0
A0
U/D
9V
GND
AL/STILL PAUSE
SLOW VR
I0
B3
B1
A1
OPR
LED D
LED CK
AUDIO MUTE
D. FF
RESET
GND
TIMER
CAMERA SIG
BATT. CHECK
UN LOAD
CAMERA 12V
CASS. LAMP
AL SW
DRUM M.
EAR
A. REC
GND
REC
CAMERA AUD.
12V
(4700μF)
GND
DIRECT CONNECTION
DIRECT CONNECTION
(※)
03 MECHA CON
CAMERA
REMOTE
VIDEO IN/OUT
GND
BATT/T.R
GND
AUDIO OUT
START/STOP
AUDIO IN
GND
GND
12V
B1
B3
I2
B2
I1
I0
B0
SLOW VR
MIC JACK
EAR JACK
GND
MIC IN
(LINE IN)
GND
UL SW
LED
+B
PHOTO TR
START SENS
+B
END SENSOR
+B
CASS LAMP
10V
GND
DEW SENS.
10V
I2
I1
B2
B0
A0
UP/DOWN
9V
GND
AL/STILL PAUSE
SLOW VR
I0
B3
B1
A1
COUNTER OPERATION
LED DATE
LED CLOCK
AUDIO MUTE
D. FF
RESET
GND
TIMER
CAMERA SIG
BATT. CHECK
UN LOAD
CAMERA 12V
CASS. LAMP
AL SW
DRUM M
EAR
A. REC
GND
REC
CAMERA AUD
12V
UNLOADING SW
(TAKE-UP SENSOR)

8.13 DC LINE WIRING DIAGRAM



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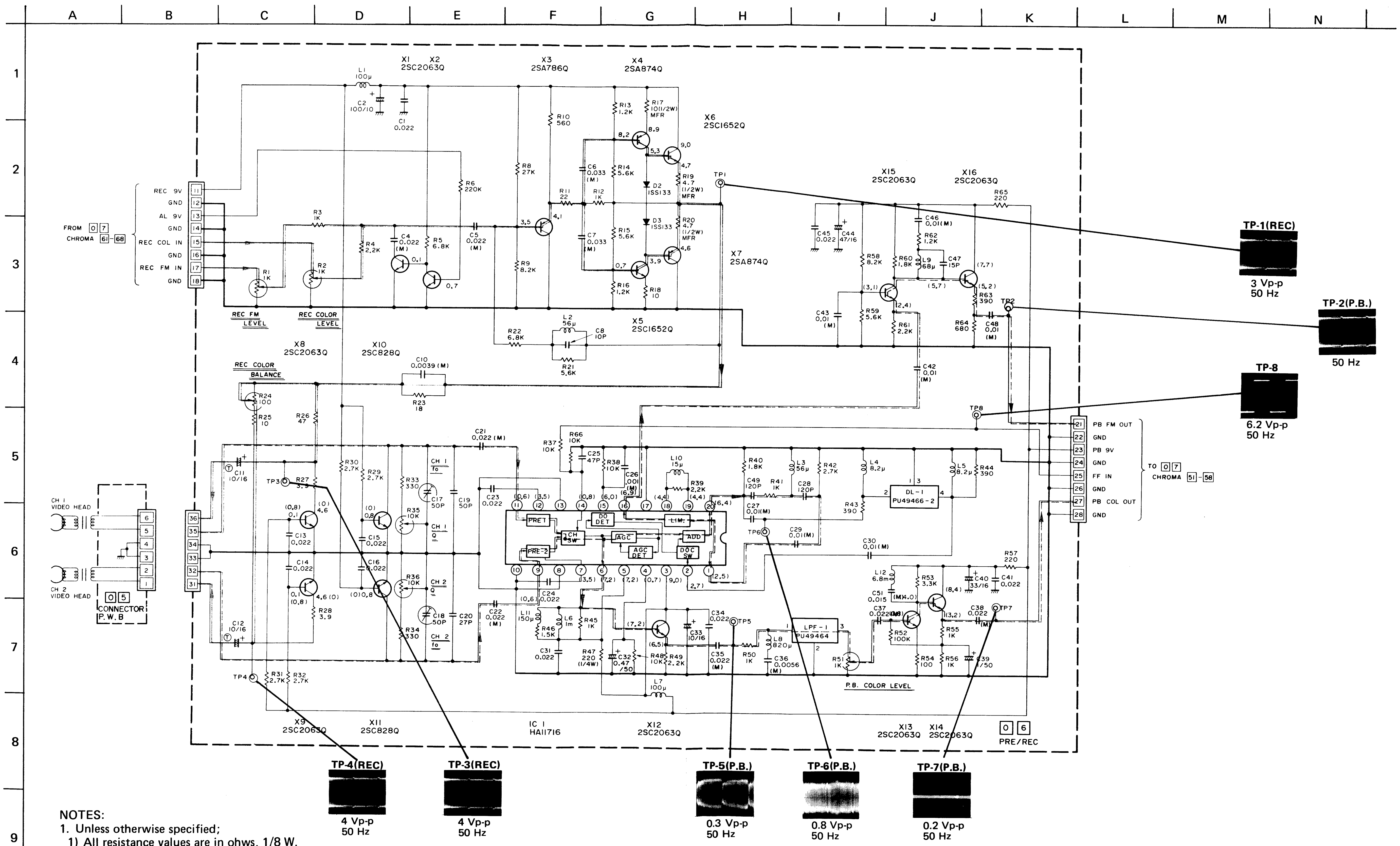
9
BATTERY
12 V
T. SW
TUNER & ADAPTER CONNECTOR 7 P
D9
SW-3
X24
BATTERY COMMON
BATTERY 12 V
12 V
E. SW. X20, X21
E. SW. X22, X23
CIRCUIT
PB 9 V
EE 9 V
RF 9 V
08 Y AMP
(POWER) SW-1
R7
F1
REG. (9 V) X1, IC1
D1
E. SW. X2
E. SW. X5
E. SW. X3, X4
REC 9 V
AL 9 V
PB 9 V
07 CHROMA
06 PRE / REC AMP
HEATER (POSISTOR)
T.U SENSOR
START SENSOR
END SENSOR
CASSETTE LAMP
CAMERA CONNECTOR 10 P
REG. (10 V) X2
03 MECHA - CON
9 V
12 V
10 V
01 AUDIO & CPU
F2
F3
E. SW. X8
E. SW. X9
E. SW. X10
PB (REC 9 V) 9 V
AL 9 V
REC 9 V
09 SERVO
10 MDA

8.14 PRE/RECORD CIRCUIT SCHEMATIC DIAGRAM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G
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K
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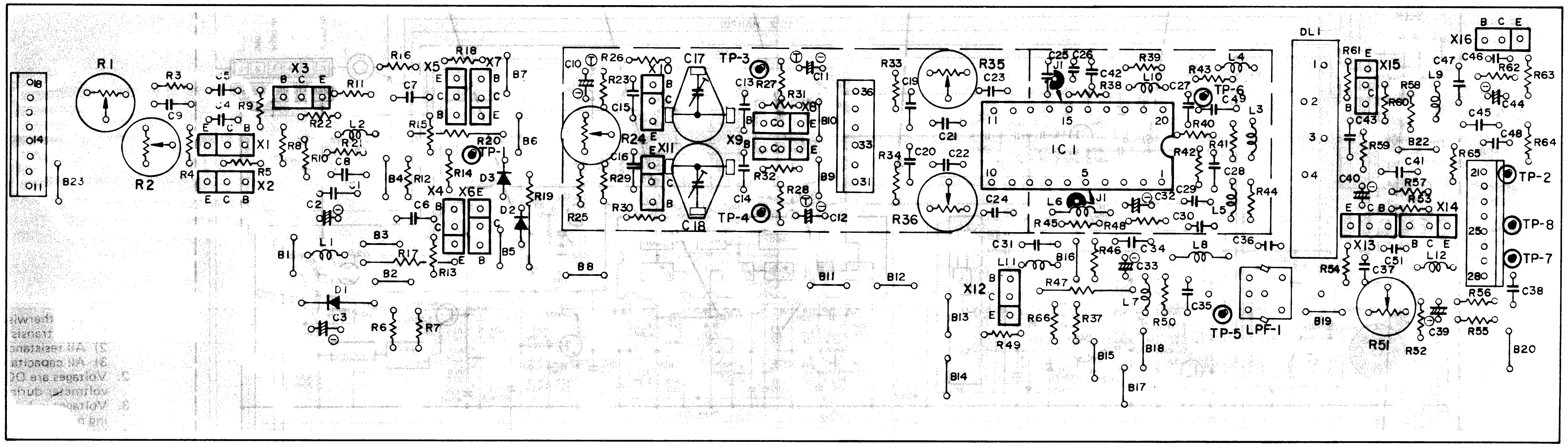
M
N
1
2
3
4
5
6
7
8
9
X1 X2 2SC2063Q
X3 2SA786Q
X4 2SA874Q
X6 2SC1652Q
X7 2SA874Q
X5 2SC1652Q
X8 2SC2063Q
X10 2SC828Q
X15 2SC2063Q
X16 2SC2063Q
X9 2SC2063Q
X11 2SC828Q
IC 1 HA11716
X12 2SC2063Q
X13 X14 2SC2063Q 2SC2063Q
06 PRE/REC
FROM 07 CHROMA 61-68
REC 9V
GND
AL 9V
GND
REC COL IN
GND
REC FM IN
GND
REC FM LEVEL
REC COLOR LEVEL
REC COLOR BALANCE
P.B. COLOR LEVEL
CH 1 VIDEO HEAD
CH 2 VIDEO HEAD
05 CONNECTOR P.W.B
PB FM OUT
GND
PB 9V
GND
FF IN
GND
PB COL OUT
GND
TO 07 CHROMA 51-58
PRE1
PRE-2
CH SW
DO DET
AGC
AGC DET
LIM.
ADD
DOC SW
DL-1 PU49466-2
LPF-1 PU49464
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP-1(REC) 3 Vp-p 50 Hz
TP-2(P.B.) 50 Hz
TP-8 6.2 Vp-p 50 Hz
TP-4(REC) 4 Vp-p 50 Hz
TP-3(REC) 4 Vp-p 50 Hz
TP-5(P.B.) 0.3 Vp-p 50 Hz
TP-6(P.B.) 0.8 Vp-p 50 Hz
TP-7(P.B.) 0.2 Vp-p 50 Hz

NOTES:

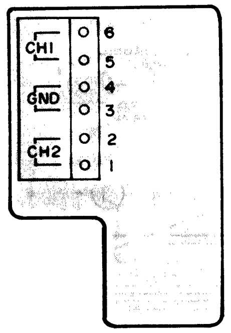
1. Unless otherwise specified;
   1) All resistance values are in ohws, 1/8 W.
   2) All capacitance values are in μF.
2. Voltages are DC-measured with a digital voltmeter during recording mode.
3. Where voltage differs between recording and playback, the voltage duirng playback is shown in parentheses.

8.15 PRE/RECORD AND CONNECTOR CIRCUIT BOARDS

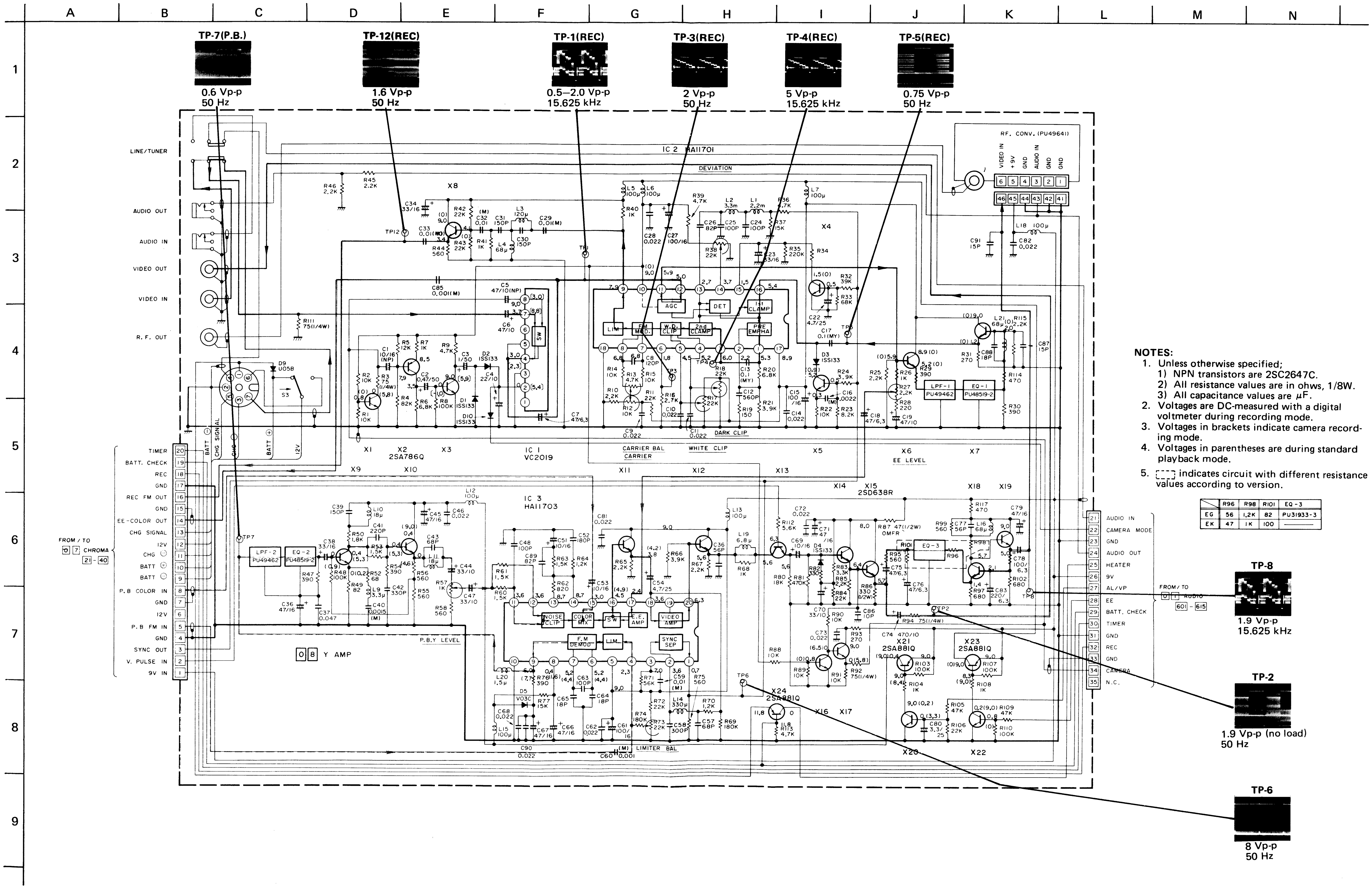
– PRE/RECORD BOARD –


R1
R2
R3
R4
R5
X1
X2
X3
R11
R16
R18
X5
X7
B7
L2
R21
R22
R8
R10
C8
C1
C2
C3
C5
C6
C7
C9
C4
R9
R15
R20
TP-1
R12
R14
B4
X4
X6
D3
D2
R19
B6
B5
B1
L1
B3
R17
R13
B2
D1
R6
R7
B23
C10
R26
X10
C17
TP-3
C13
R27
C11
R31
X8
R23
C15
R24
X11
C16
R29
R25
R30
C18
TP-4
C14
X9
R32
R28
C12
B10
B9
B8
B11
B12
R33
C19
R35
C23
R34
C20
C22
C21
R36
C24
IC1
C25
C26
J1
C42
R38
R39
L10
C27
R43
L4
TP-6
C49
L3
R40
R42
R41
C28
C29
C32
R44
L6
R45
R48
C30
L5
C31
L11
B16
R46
C34
L8
C36
C33
X12
R47
L7
C35
R50
R66
R37
B13
R49
B14
B15
B18
B17
TP-5
LPF-1
DL1
R61
X15
R58
R60
C43
L9
C47
C46
R62
R63
C44
C45
C48
R64
X16
R65
R59
B22
C40
C41
R57
R53
X14
TP-2
TP-8
TP-7
X13
C51
L12
R54
C37
R56
C38
B19
R51
C39
R52
R55
B20

– CONNECTOR BOARD –


CH1
GND
CH2
6
5
4
3
2
1

8.16 LUMINANCE (Y) CIRCUIT SCHEMATIC DIAGRAM


A
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K
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1
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6
7
8
9
TP-7(P.B.)
0.6 Vp-p
50 Hz
TP-12(REC)
1.6 Vp-p
50 Hz
TP-1(REC)
0.5–2.0 Vp-p
15.625 kHz
TP-3(REC)
2 Vp-p
50 Hz
TP-4(REC)
5 Vp-p
15.625 kHz
TP-5(REC)
0.75 Vp-p
50 Hz
RF. CONV. (PU49641)
IC 2 HA11701
DEVIATION
LINE/TUNER
AUDIO OUT
AUDIO IN
VIDEO OUT
VIDEO IN
R. F. OUT
AGC
DET
1st CLAMP
LIM
FM MOD.
W.D. CLIP
2nd CLAMP
PRE EMPHA
DARK CLIP
CARRIER BAL
CARRIER
WHITE CLIP
EE LEVEL
IC 1 VC2019
X2 2SA786Q
X15 2SD638R
LPF-1 PU49462
EQ-1 PU48519-2
TIMER
BATT. CHECK
REC
GND
REC FM OUT
GND
EE-COLOR OUT
CHG SIGNAL
12V
CHG
BATT
BATT
P.B COLOR IN
GND
12V
P.B FM IN
GND
SYNC OUT
V. PULSE IN
9V IN
FROM / TO
CHROMA
21 - 40
IC 3 HA11703
LPF-2 PU49462
EQ-2 PU48519-2
NOISE CLIP
COLOR MIX
SW
E.F. AMP
VIDEO AMP
F.M DEMOD
LIM
SYNC SEP
P.B.Y LEVEL
08 Y AMP
LIMITER BAL
OMFR
EQ-3
X21 2SA881Q
X23 2SA881Q
X24 2SA881Q
AUDIO IN
CAMERA MODE
GND
AUDIO OUT
HEATER
9V
AL/VP
EE
BATT. CHECK
TIMER
GND
REC
GND
CAMERA
N.C.
FROM/ TO
601 - 615
TP-8
1.9 Vp-p
15.625 kHz
TP-2
1.9 Vp-p (no load)
50 Hz
TP-6
8 Vp-p
50 Hz

NOTES:

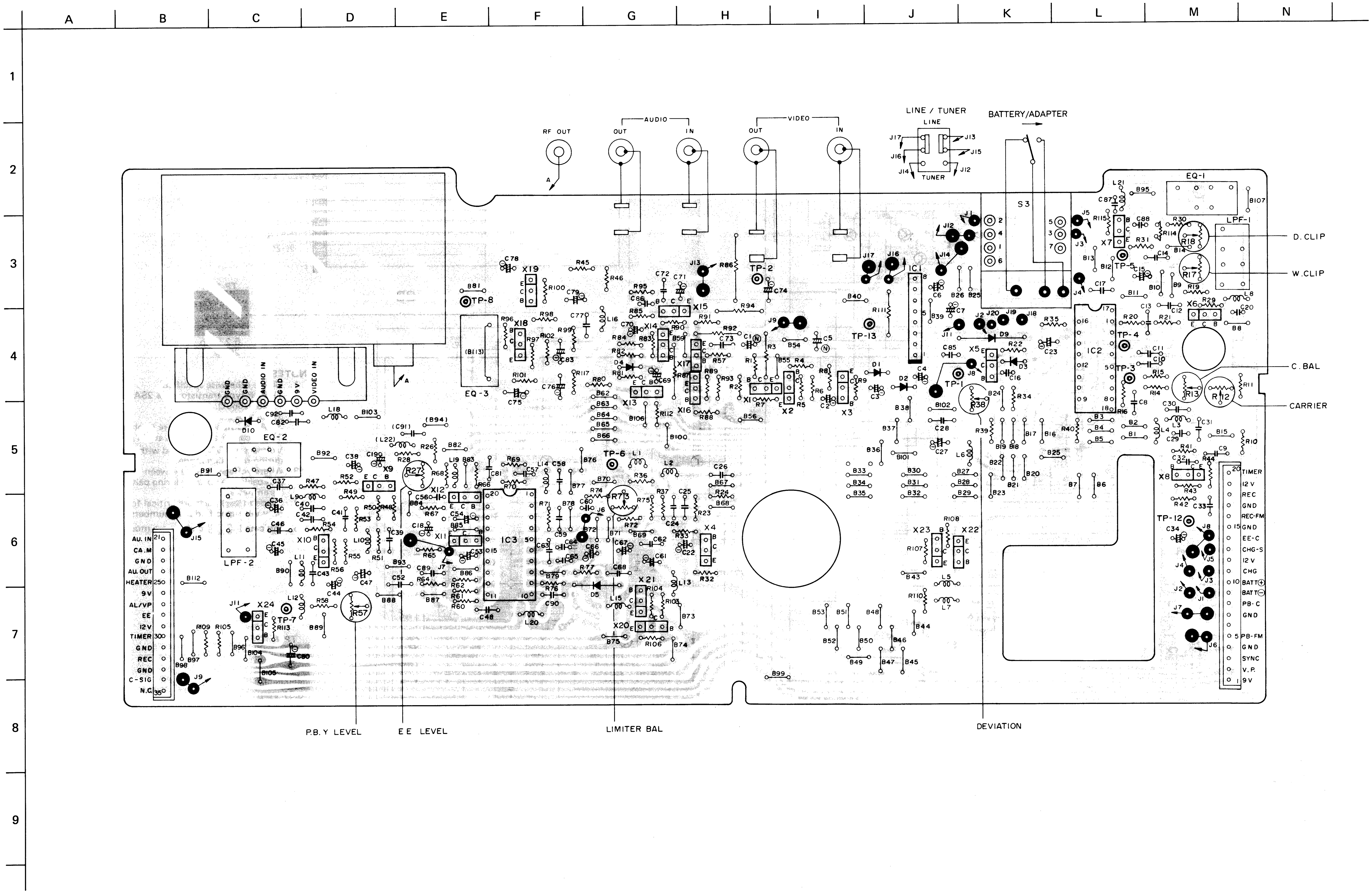
1. Unless otherwise specified;
   1) NPN transistors are 2SC2647C.
   2) All resistance values are in ohws, 1/8W.
   3) All capacitance values are μF.
2. Voltages are DC-measured with a digital voltmeter during recording mode.
3. Voltages in brackets indicate camera recording mode.
4. Voltages in parentheses are during standard playback mode.
5. ┌┄┐ indicates circuit with different resistance values according to version.

	R96	R98	R101	EQ-3
EG	56	1.2K	82	PU31933-3
EK	47	1K	100	———

LUMINANCE (Y) SCHEMATIC 8-16
(PRE/REC. AND CONNECTOR BOARDS)

8-16 LUMINANCE (Y) SCHEMATIC
(PRE/REC. AND CONNECTOR BOARDS)

8.17 LUMINANCE (Y) CIRCUIT BOARD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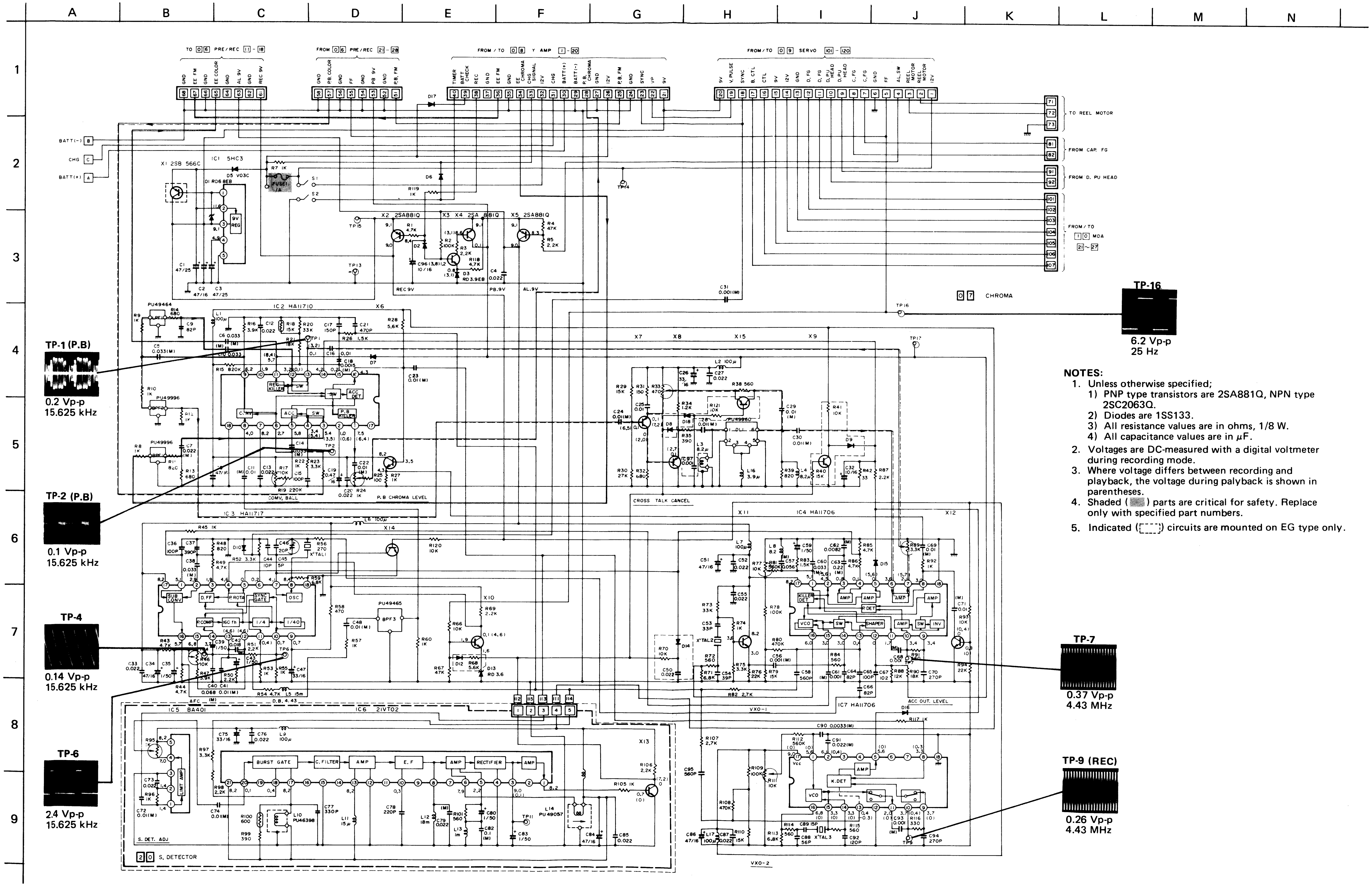
6
7
8
9
RF OUT
AUDIO
OUT
IN
VIDEO
OUT
IN
LINE / TUNER
LINE
TUNER
BATTERY/ADAPTER
S3
EQ-1
LPF-1
D.CLIP
W.CLIP
C.BAL
CARRIER
EQ-2
EQ-3
LPF-2
IC1
IC2
IC3
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8
TP-12
TP-13
GND
GND
AUDIO IN
9V
VIDEO IN
AU. IN
CA.M
GND
AU. OUT
HEATER
9V
AL/VP
EE
12V
TIMER
GND
REC
GND
C-SIG
N.C.
TIMER
12 V
REC
GND
REC-FM
GND
EE-C
CHG-S
12 V
CHG
BATT⊕
BATT⊖
PB-C
GND
PB-FM
GND
SYNC
V.P.
9V
P.B. Y LEVEL
E E LEVEL
LIMITER BAL
DEVIATION

8.18 CHROMINANCE (CHROMA) AND SECAM DET. CIRCUITS SCHEMATIC DIAGRAM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7
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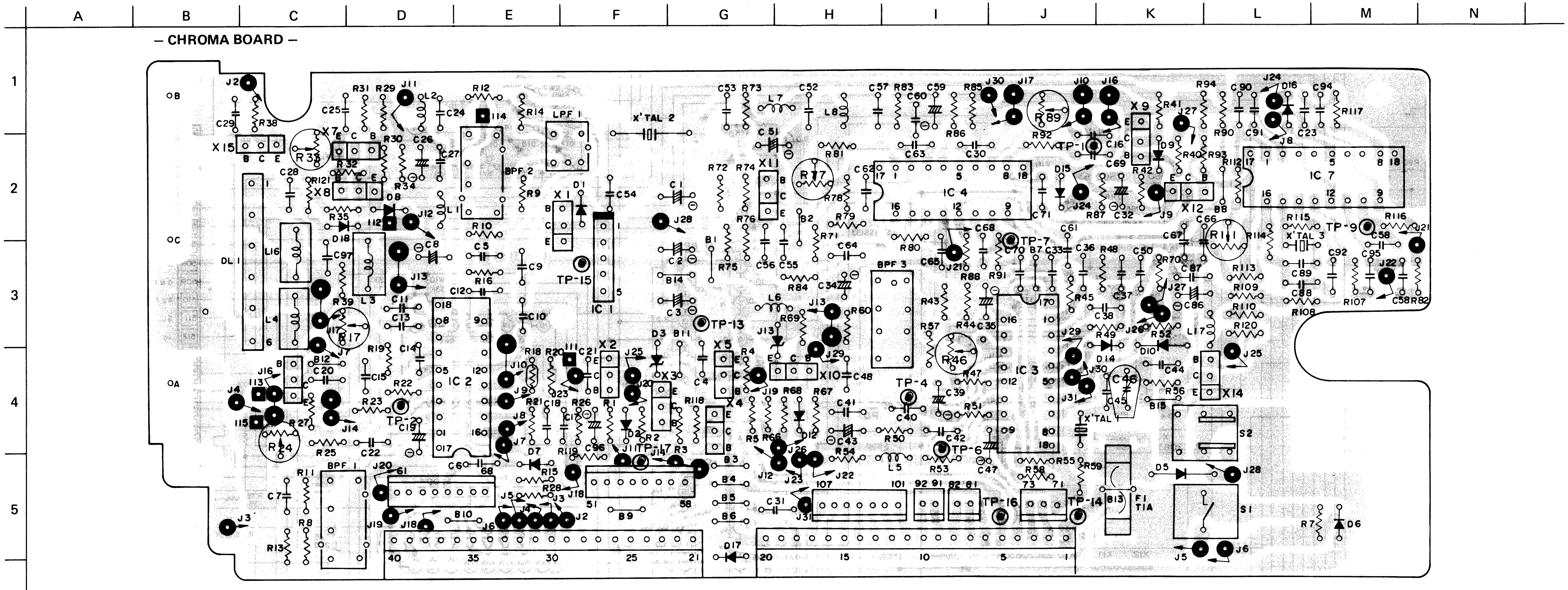
9
TO 06 PRE/REC 11 - 18
FROM 06 PRE/REC 21 - 28
FROM / TO 08 Y AMP 1 - 20
FROM / TO 09 SERVO 101 - 120
TO REEL MOTOR
FROM CAP. FG
FROM D. PU HEAD
FROM / TO 10 MDA 21~27
BATT(-)
CHG
BATT(+)
X1 2SB 566C
IC1 5HC3
FUSE1 1A
X2 2SA881Q
X3 X4 2SA 881Q
X5 2SA881Q
TP15
TP13
TP14
REC 9V
P.B. 9V
AL. 9V
IC2 HA11710
X6
IC3 HA11717
X14
X10
IC4 HA11706
X7
X8
X15
X9
X11
X12
CROSS TALK CANCEL
P.B CHROMA LEVEL
COMV. BALL
AFC
ACC OUT. LEVEL
VXO-1
VXO-2
IC5 BA401
IC6 21VT02
IC7 HA11706
X13
BURST GATE
C. FILTER
AMP
E. F
RECTIFIER
S. DET. ADJ
20 S. DETECTOR
07 CHROMA
TP-1 (P.B)
0.2 Vp-p
15.625 kHz
TP-2 (P.B)
0.1 Vp-p
15.625 kHz
TP-4
0.14 Vp-p
15.625 kHz
TP-6
2.4 Vp-p
15.625 kHz
TP-16
6.2 Vp-p
25 Hz
TP-7
0.37 Vp-p
4.43 MHz
TP-9 (REC)
0.26 Vp-p
4.43 MHz

NOTES:

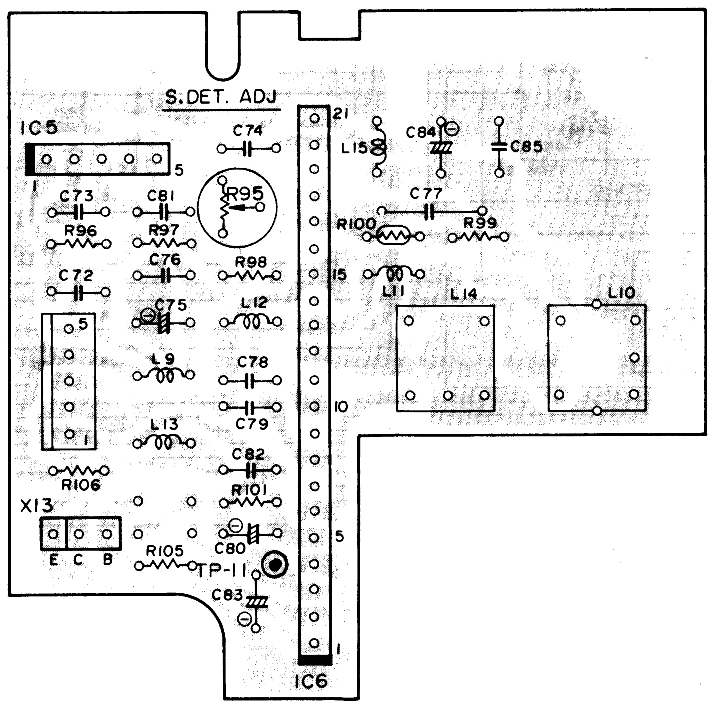
1. Unless otherwise specified;
   1) PNP type transistors are 2SA881Q, NPN type 2SC2063Q.
   2) Diodes are 1SS133.
   3) All resistance values are in ohms, 1/8 W.
   4) All capacitance values are in μF.
2. Voltages are DC-measured with a digital voltmeter during recording mode.
3. Where voltage differs between recording and playback, the voltage during palyback is shown in parentheses.
4. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
5. Indicated ([‑‑‑]) circuits are mounted on EG type only.

8.19 CHROMINANCE (CHROMA) AND SECAM DET. CIRCUIT BOARDS

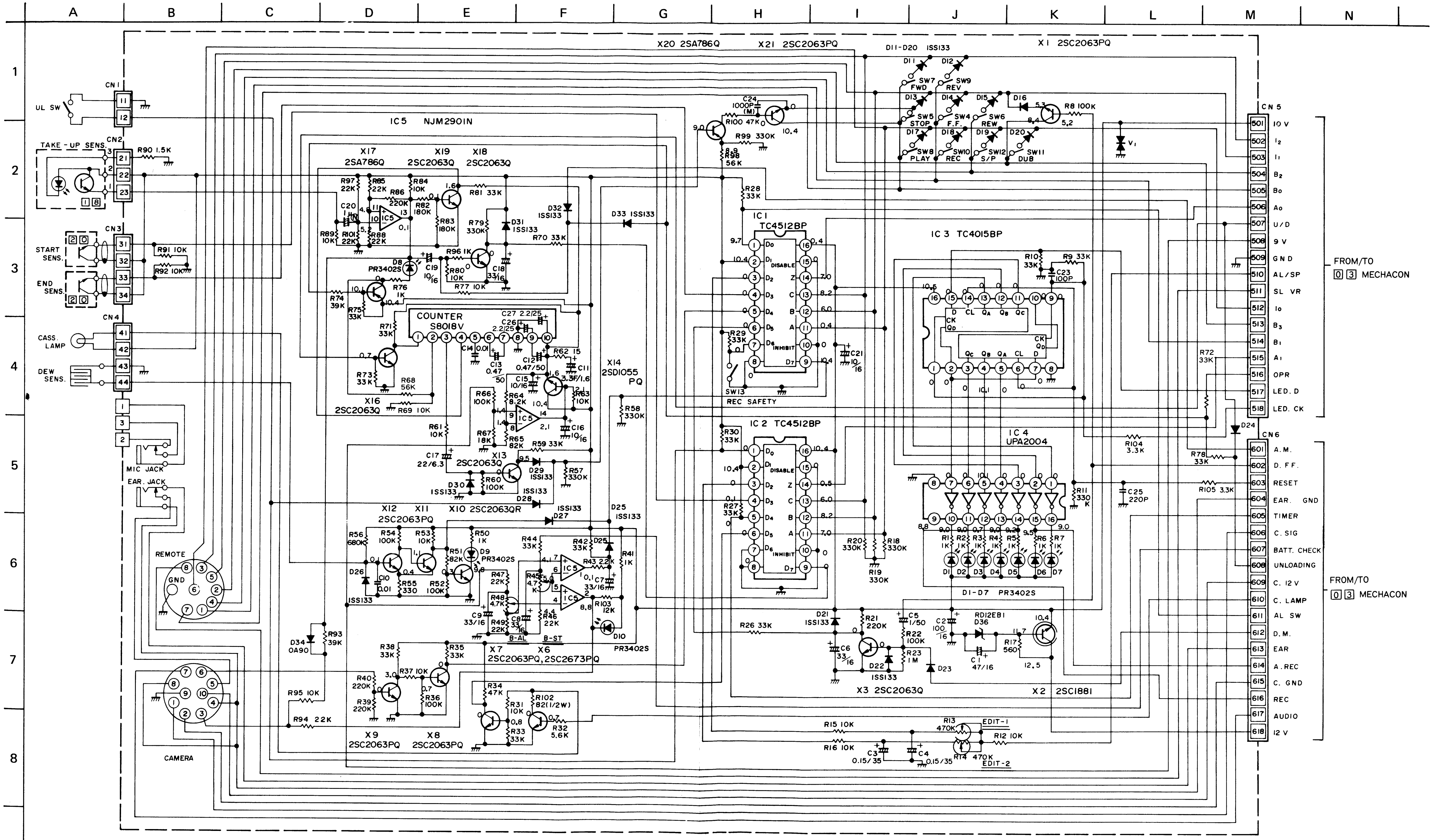
– CHROMA BOARD –


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
IC 1
IC 2
IC 3
IC 4
IC 7
BPF 1
BPF 2
BPF 3
LPF 1
X'TAL 1
X'TAL 2
X'TAL 3
DL 1
TP-1
TP-2
TP-4
TP-6
TP-7
TP-9
TP-13
TP-14
TP-15
TP-16
TP-17
S1
S2
F1 T1A

– SECAM DET. BOARD –


6
7
8
9
S.DET. ADJ
IC5
IC6
R95
L14
L10
X13
TP-11

8.20 MECHANISM CONTROL (MECHACON) CIRCUIT SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
X20 2SA786Q
X21 2SC2063PQ
D11-D20 1SS133
X1 2SC2063PQ
CN1
UL SW
CN2
TAKE - UP SENS.
R90 1.5K
CN3
START SENS.
END SENS.
R91 10K
R92 10K
CN4
CASS. LAMP
DEW SENS.
MIC JACK
EAR. JACK
REMOTE
GND
CAMERA
IC5 NJM2901N
X17 2SA786Q
X19 2SC2063Q
X18 2SC2063Q
D32 1SS133
D33 1SS133
COUNTER S8018V
X16 2SC2063Q
X13 2SC2063Q
X14 2SD1055 PQ
X12 X11 2SC2063PQ
X10 2SC2063QR
X7 X6 2SC2063PQ,2SC2673PQ
X9 2SC2063PQ
X8 2SC2063PQ
D34 OA90
D10 PR3402S
D9 PR3402S
D8 PR3402S
SW7 FWD
SW9 REV
SW5 STOP
SW4 F.F.
SW6 REW
SW8 PLAY
SW10 REC
SW12 S/P
SW11 DUB
R8 100K
IC1 TC4512BP
IC2 TC4512BP
IC3 TC4015BP
IC4 UPA2004
SW13 REC SAFETY
D1-D7 PR3402S
RD12EB1 D36
X3 2SC2063Q
X2 2SC1881
EDIT-1
EDIT-2
CN5
501 10 V
502 I2
503 I1
504 B2
505 B0
506 A0
507 U/D
508 9 V
509 GND
510 AL/SP
511 SL VR
512 I0
513 B3
514 B1
515 A1
516 OPR
517 LED. D
518 LED. CK
FROM/TO 03 MECHACON
D24
CN6
601 A.M.
602 D. FF.
603 RESET
604 EAR. GND
605 TIMER
606 C. SIG
607 BATT. CHECK
608 UNLOADING
609 C. 12 V
610 C. LAMP
611 AL SW
612 D.M.
613 EAR
614 A.REC
615 C. GND
616 REC
617 AUDIO
618 12 V
FROM/TO 03 MECHACON

9

CAMERA CONN.
1. VIDEO IN/OUT
2. GND
3. BATT. ALARM + REC RUN
4. GND
5. AUDIO (P.B.)
6. CTL
7. AUDIO (REC.)
8 GND
9. GND
10. POWER (12 V)

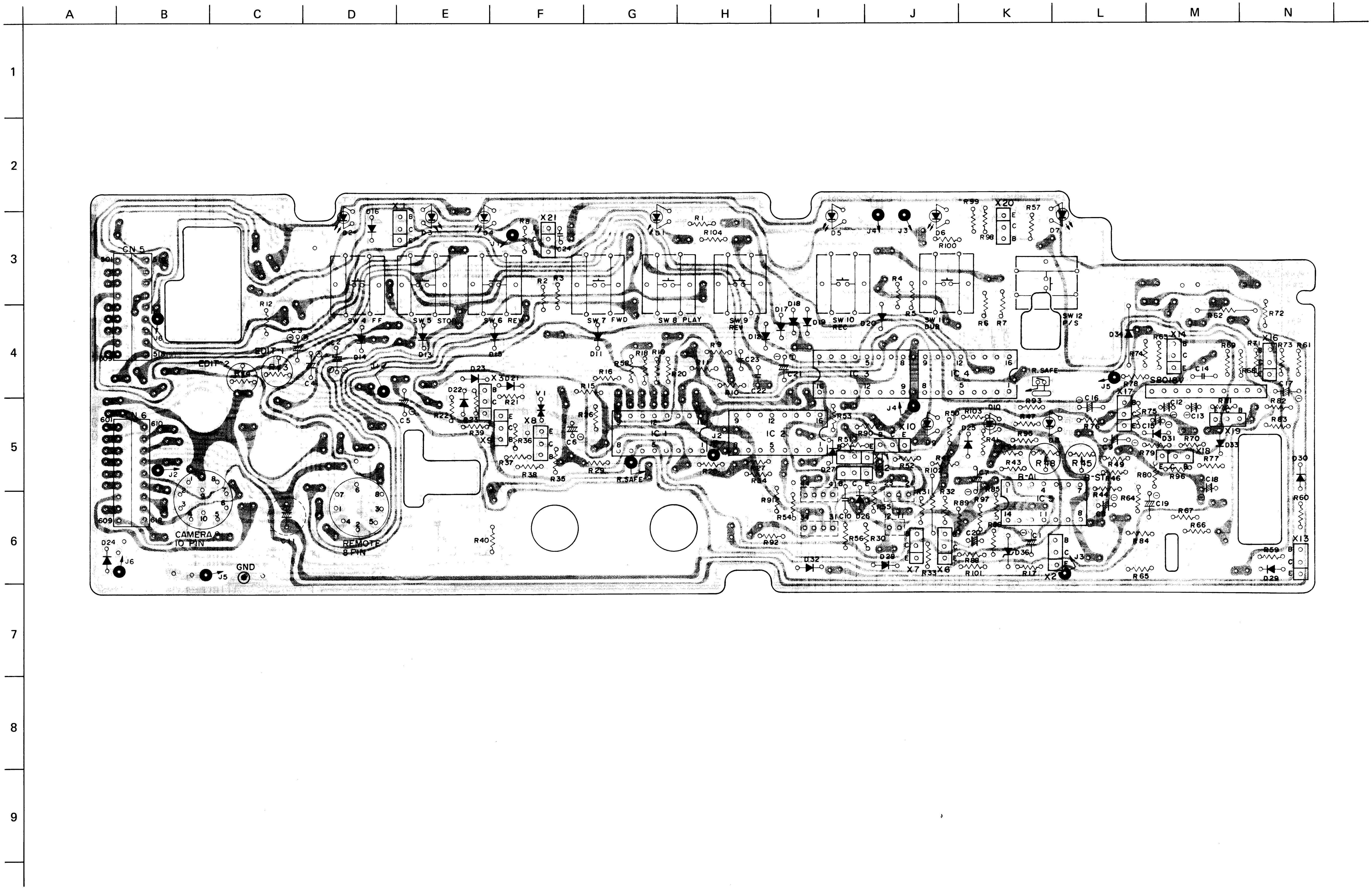
REMOTE CONN.
1. B_1
2. B_3
3. I_2
4. B_2
5. I_1
6. I_0
7. B_0
8. SLOW VR

LED

D1. PB	D9. DEW
D2. FF	D10. B.DOWN
D3. STOP	
D4. REW	
D5. REC	
D6. DUB	
D7. S/P	
D8. RUN	

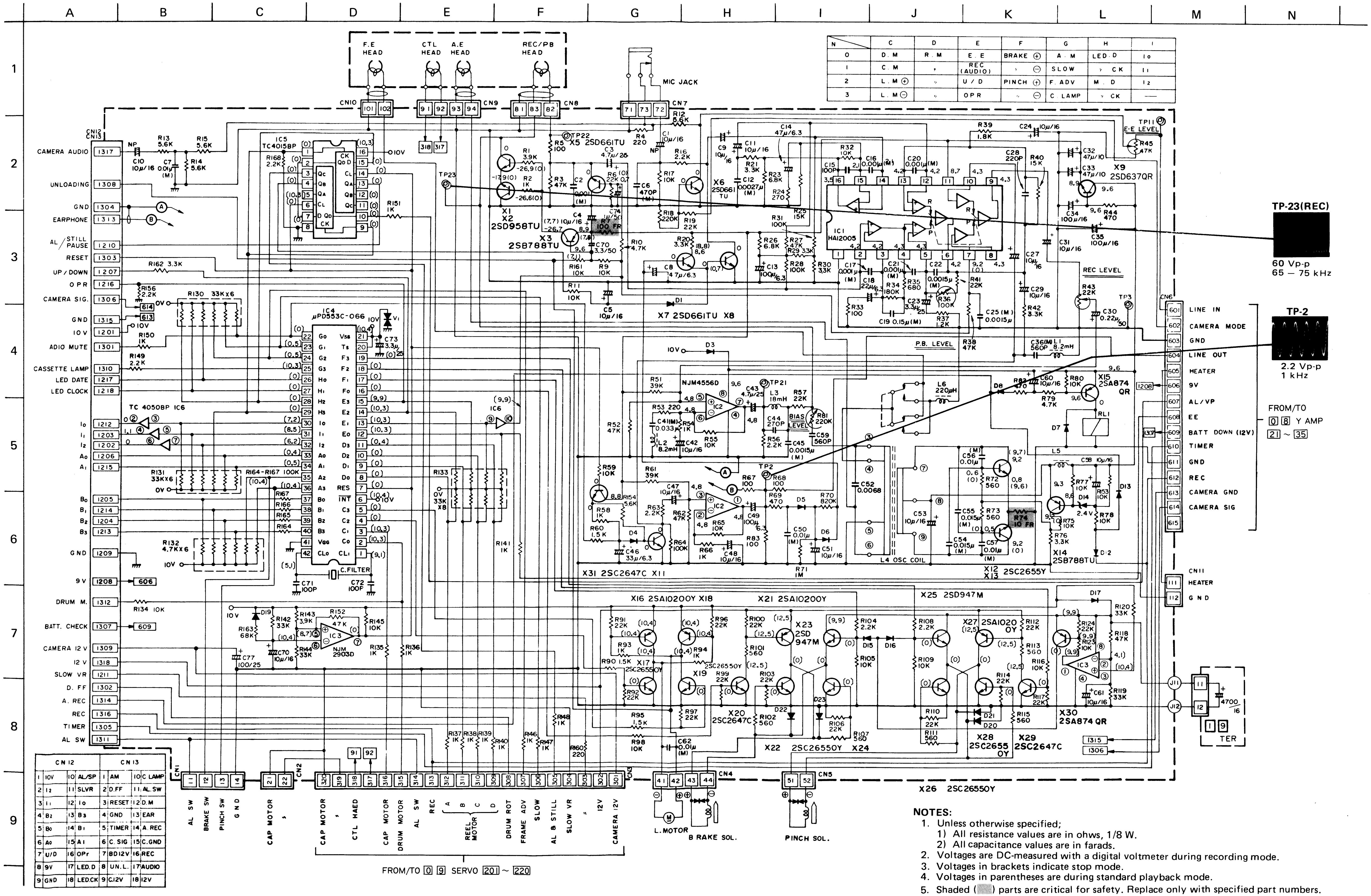
NOTES:
Unless otherwise specified;
1) All resistance values are in ohms, 1/8 W.
2) All capacitance values are in μF.
3) Voltage are DC-measured with a digital voltmeter during stop mode.

8.21 MECHANISM CONTROL (MECHACON) CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
CN 5
CN 6
EDIT 1
EDIT 2
CAMERA 10 PIN
REMOTE 8 PIN
GND
SW 4 FF
SW 5 STOP
SW 6 REW
SW 7 FWD
SW 8 PLAY
SW 9 REV
SW 10 REC
SW 11 DUB
SW 12 P/S
IC 1
IC 2
IC 3
IC 4
IC 5
R.SAFE
B-SIN
B-AI
SB016V
X20
X21
X14
X16
X17
X18
X19
X13
X10
X7
X6
X2
X8
X9
J6
J5
J4
J3
J2
J41
D24
D29
D30
D32
D33
D34
D36
R 65
R 84
R 40

8-21 MECHACON BOARD
(AUDIO & CPU SCHEMATIC)

8.22 AUDIO & CPU CIRCUIT SCHEMATIC DIAGRAM


F.E HEAD
CTL HEAD
A.E HEAD
REC/PB HEAD
MIC JACK
CN7
CN8
CN9
CN10
CN12
CN13
CAMERA AUDIO
UNLOADING
GND
EARPHONE
AL/STILL PAUSE
RESET
UP/DOWN
OPR
CAMERA SIG.
GND
10V
ADIO MUTE
CASSETTE LAMP
LED DATE
LED CLOCK
9V
DRUM M.
BATT. CHECK
CAMERA 12V
12V
SLOW VR
D. FF
A. REC
REC
TIMER
AL SW
IC5 TC4015BP
IC4 μPD553C-066
TC 4050BP IC6
IC1 HA12005
IC2 NJM4556D
IC3 NJM 2903D
X5 2SD661TU
X1 X2 2SD958TU
X3 2SB788TU
X6 2SD661 TU
X7 2SD661TU X8
X9 2SD637QR
X15 2SA874 QR
X14 2SB788TU
X12 X13 2SC2655Y
X31 2SC2647C X11
X16 2SA1020OY X18
X21 2SA1020OY
X25 2SD947M
X23 2SD 947M
X17 2SC2655OY
X19 2SC2655OY
X20 2SC2647C
X22 2SC2655OY X24
X27 2SA1020 OY
X28 2SC2655 OY
X29 2SC2647C
X30 2SA874 QR
X26 2SC2655OY
P.B. LEVEL
REC LEVEL
E-E LEVEL
BIAS LEVEL
L4 OSC COIL
C.FILTER
TP-23(REC)
60 Vp-p
65 – 75 kHz
TP-2
2.2 Vp-p
1 kHz
LINE IN
CAMERA MODE
GND
LINE OUT
HEATER
9V
AL/VP
EE
BATT DOWN (12V)
TIMER
GND
REC
CAMERA GND
CAMERA SIG
FROM/TO 08 Y AMP 21 ~ 35
CN11
HEATER
GND
TER
AL SW
BRAKE SW
PINCH SW
GND
CAP MOTOR
CTL HAED
CAP MOTOR
DRUM MOTOR
AL SW
REC
REEL MOTOR
DRUM ROT
FRAME ADV
SLOW
AL & STILL
SLOW VR
12V
CAMERA 12V
FROM/TO 09 SERVO 201 ~ 220
CN4
L. MOTOR
B RAKE SOL.
CN5
PINCH SOL.

N	C	D	E	F	G	H	I
0	D.M	R.M	E.E	BRAKE ⊕	A.M	LED.D	I0
1	C.M	〃	REC (AUDIO)	〃 ⊖	SLOW	〃 CK	I1
2	L.M ⊕	〃	U/D	PINCH ⊕	F. ADV	M.D	I2
3	L.M ⊖	〃	OPR	〃 ⊖	C. LAMP	〃 CK	—

CN 12				CN 13			
1	10V	10	AL/SP	1	AM	10	C. LAMP
2	I2	11	SLVR	2	D.FF	11	AL. SW
3	I1	12	I0	3	RESET	12	D.M
4	B2	13	B3	4	GND	13	EAR
5	B0	14	B1	5	TIMER	14	A. REC
6	A0	15	A1	6	C. SIG	15	C.GND
7	U/D	16	OPr	7	BD12V	16	REC
8	9V	17	LED.D	8	UN.L.	17	AUDIO
9	GND	18	LED.CK	9	C.12V	18	12V

NOTES:

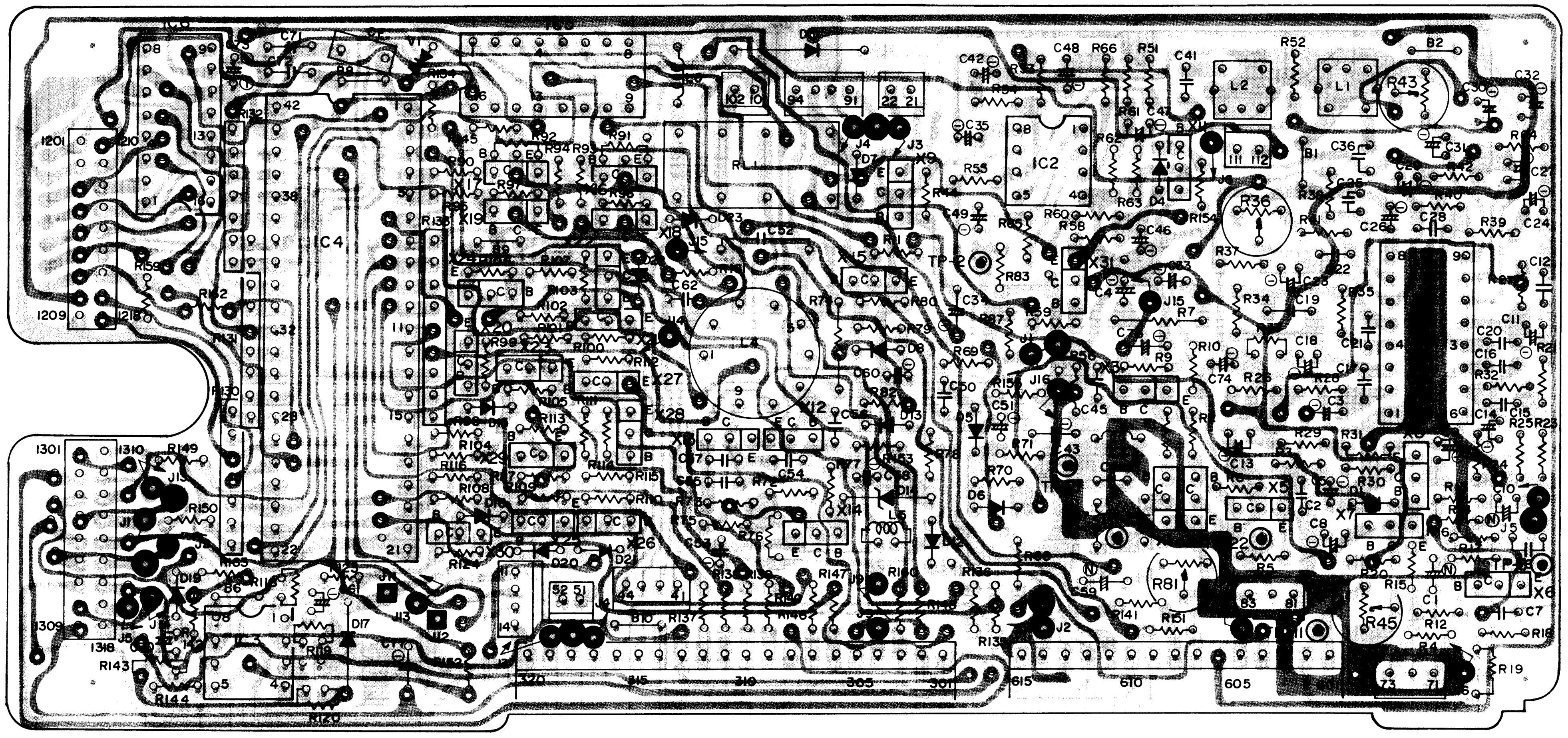
1. Unless otherwise specified;
   1) All resistance values are in ohws, 1/8 W.
   2) All capacitance values are in farads.
2. Voltages are DC-measured with a digital voltmeter during recording mode.
3. Voltages in brackets indicate stop mode.
4. Voltages in parentheses are during standard playback mode.
5. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

AUDIO & CPU SCHEMATIC 8-22
(MECHACON BOARD)

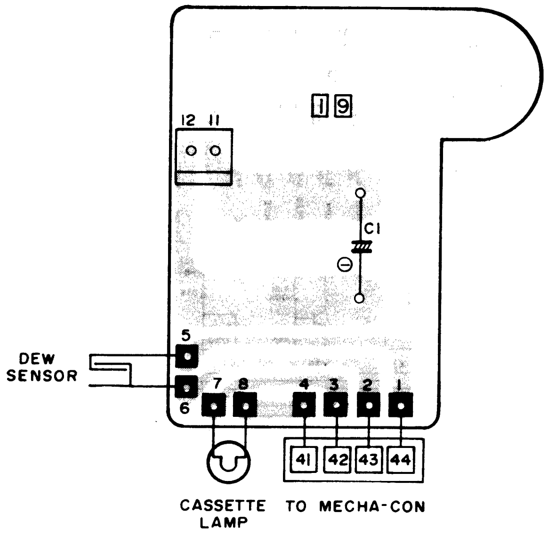
8-22 AUDIO & CPU SCHEMATIC
(MECHACON BOARD)

8.23 AUDIO & CPU, AND TERMINAL CIRCUIT BOARDS

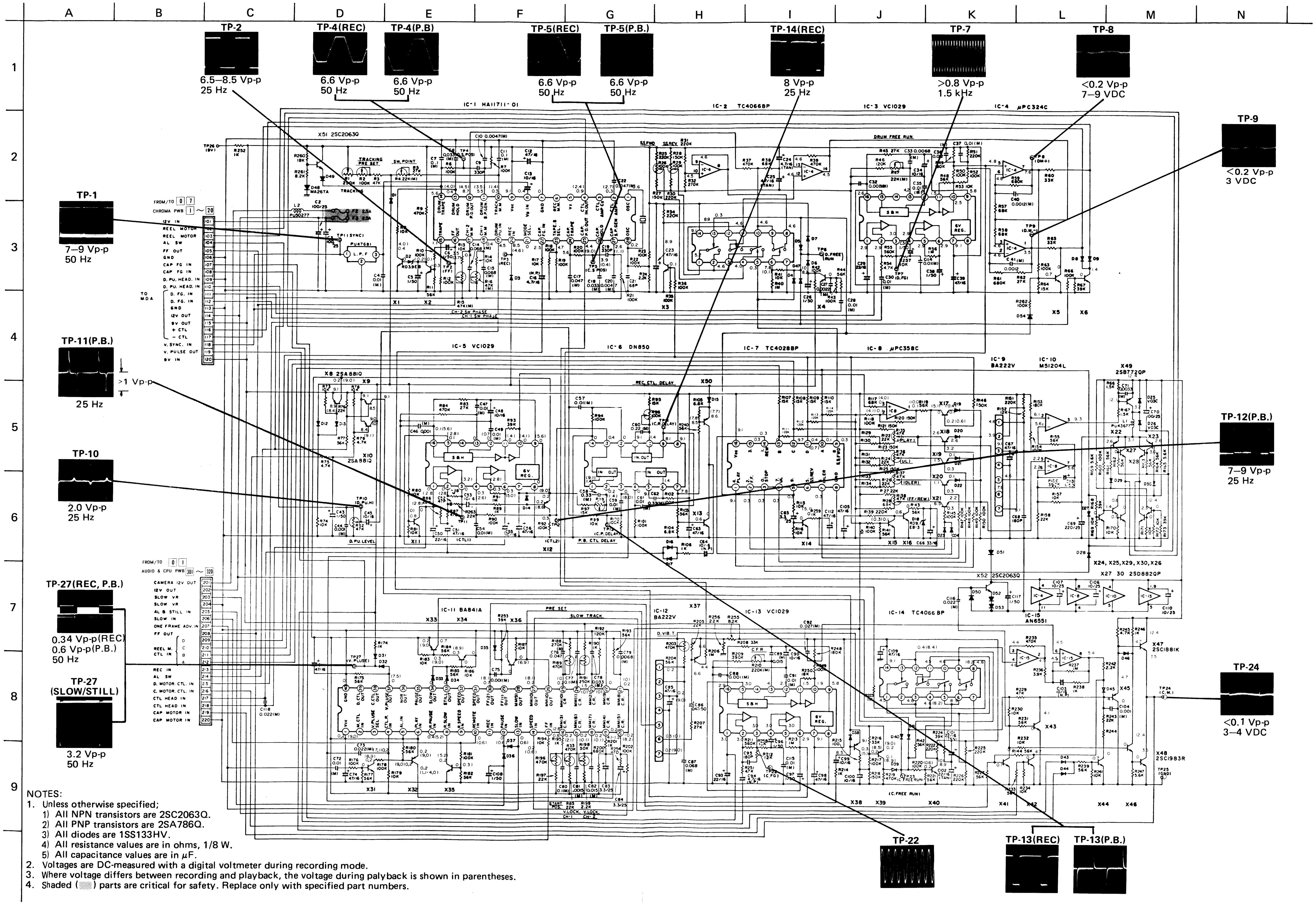
– AUDIO & CPU BOARD –


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
IC4
IC2
1201
1209
1301
1309
605
610
615

– TERMINAL BOARD –

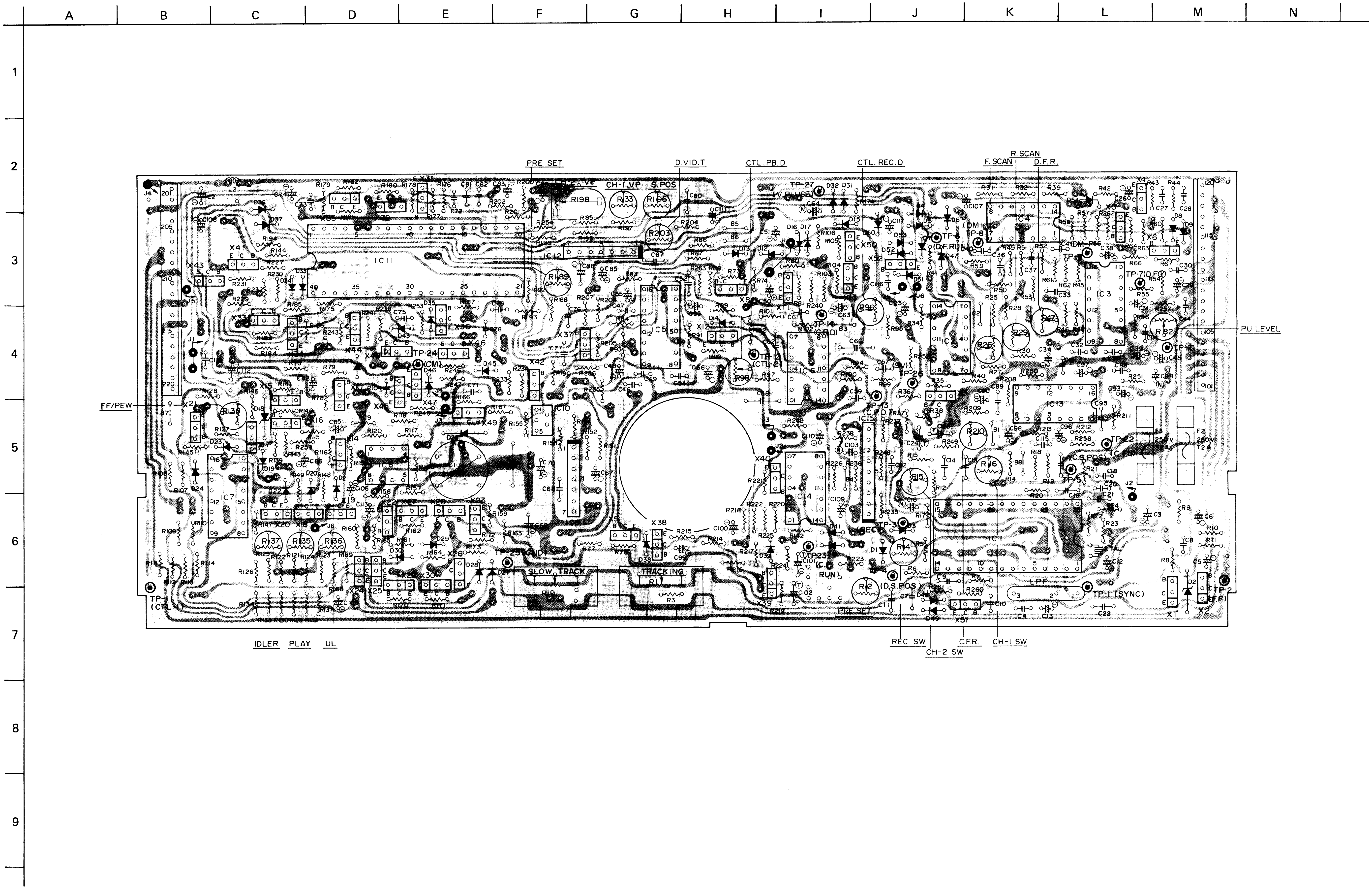

DEW
SENSOR
CASSETTE
LAMP
TO MECHA-CON
C1
41
42
43
44

8.24 SERVO CIRCUIT SCHEMATIC DIAGRAM

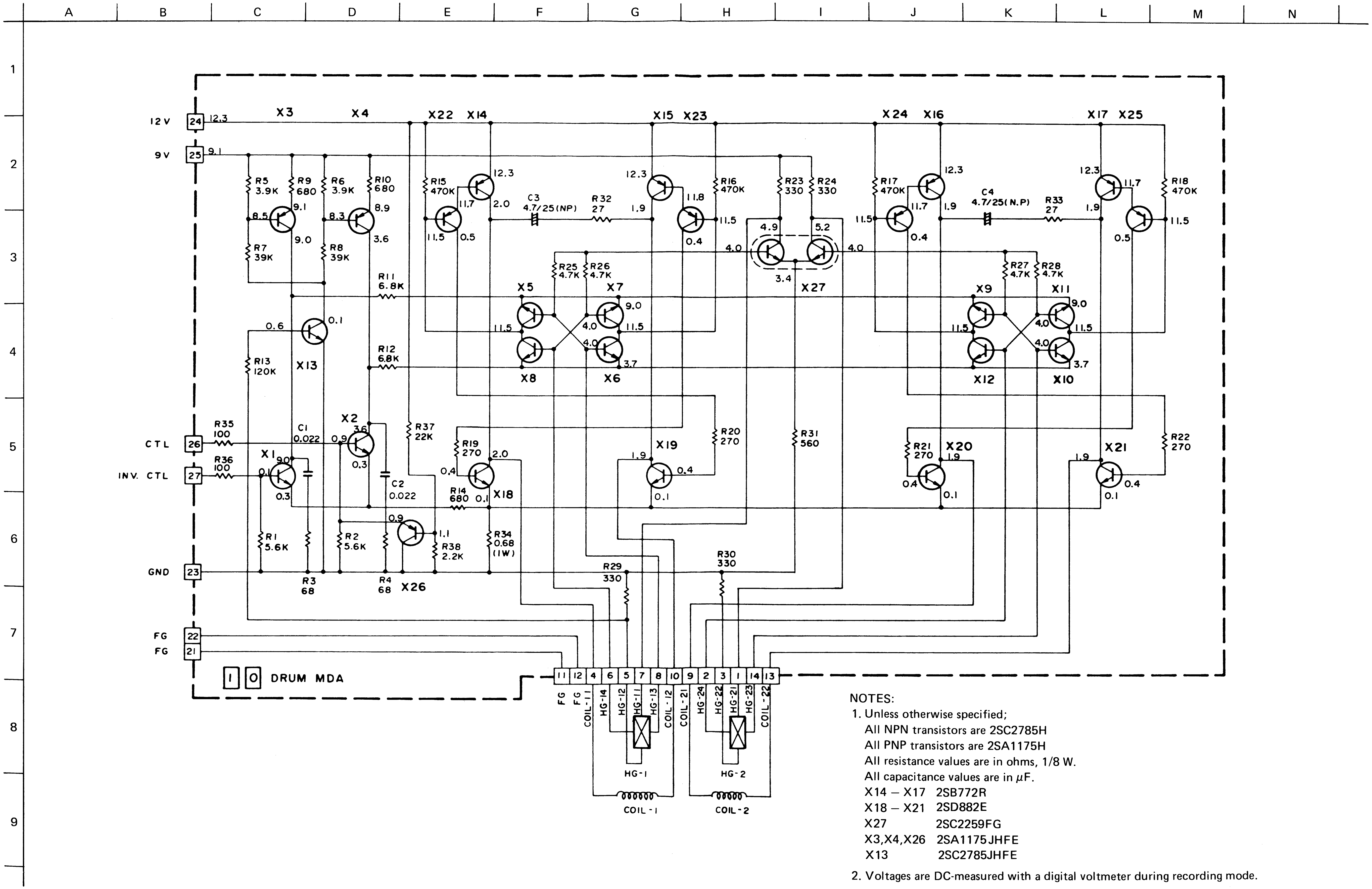

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
TP-2
6.5–8.5 Vp-p
25 Hz
TP-4(REC)
6.6 Vp-p
50 Hz
TP-4(P.B)
6.6 Vp-p
50 Hz
TP-5(REC)
6.6 Vp-p
50 Hz
TP-5(P.B.)
6.6 Vp-p
50 Hz
TP-14(REC)
8 Vp-p
25 Hz
TP-7
>0.8 Vp-p
1.5 kHz
TP-8
<0.2 Vp-p
7–9 VDC
TP-9
<0.2 Vp-p
3 VDC
TP-1
7–9 Vp-p
50 Hz
TP-11(P.B.)
>1 Vp-p
25 Hz
TP-10
2.0 Vp-p
25 Hz
TP-12(P.B.)
7–9 Vp-p
25 Hz
TP-27(REC, P.B.)
0.34 Vp-p(REC)
0.6 Vp-p(P.B.)
50 Hz
TP-27
(SLOW/STILL)
3.2 Vp-p
50 Hz
TP-24
<0.1 Vp-p
3–4 VDC
TP-22
TP-13(REC)
TP-13(P.B.)
IC-1 HA11711-01
IC-2 TC4066BP
IC-3 VC1029
IC-4 μPC324C
IC-5 VC1029
IC-6 DN850
IC-7 TC4028BP
IC-8 μPC358C
IC-9 BA222V
IC-10 M51204L
IC-11 BA841A
IC-12 BA222V
IC-13 VC1029
IC-14 TC4066BP
IC-15 AN6551
X51 2SC2063Q
X8 2SA881Q
X49 2SB772QP
X52 2SC2063Q
X24, X25, X29, X30, X26
X27 30 2SD882QP
X47 2SC1881K
X48 2SC1983R
FROM/TO CHROMA PWB
TO M.D.A.
FROM/TO AUDIO & CPU PWB
DRUM FREE RUN
PRE SET
SLOW TRACK
REC CTL DELAY
P.B. CTL DELAY
D.PU.LEVEL
TRACKING PRE SET
SW. POINT

NOTES:
1. Unless otherwise specified;
   1) All NPN transistors are 2SC2063Q.
   2) All PNP transistors are 2SA786Q.
   3) All diodes are 1SS133HV.
   4) All resistance values are in ohms, 1/8 W.
   5) All capacitance values are in μF.
2. Voltages are DC-measured with a digital voltmeter during recording mode.
3. Where voltage differs between recording and playback, the voltage during palyback is shown in parentheses.
4. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

8.25 SERVO CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
PRE SET
D.VID.T
CTL.PB.D
CTL.REC.D
R.SCAN
F.SCAN
D.F.R.
CH-1.VP
S.POS
PU LEVEL
FF/PEW
IDLER
PLAY
UL
REC SW
CH-2 SW
C.F.R.
CH-1 SW
SLOW TRACK
TRACKING
LPF
TP-1 (SYNC)
TP-25 (GND)
PRE SET
IC1
IC3
IC4
IC5
IC7
IC11
IC12
IC13
IC14
IC15

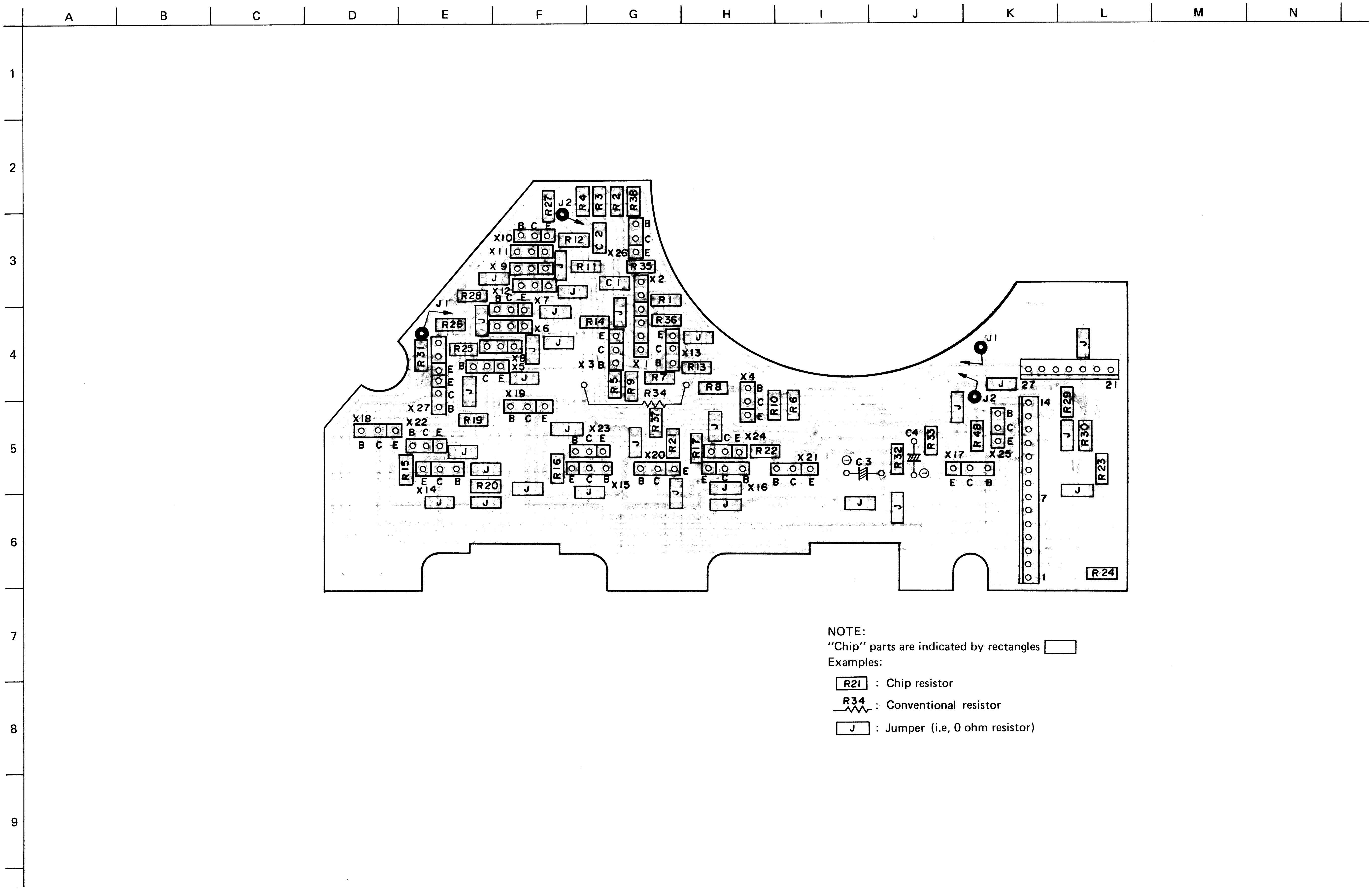
8.26 MOTOR DRIVE AMPLIFIER (MDA) SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
12V
24
12.3
9V
25
9.1
CTL
26
INV. CTL
27
GND
23
FG
22
FG
21
R35 100
R36 100
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
X13
X14
X15
X16
X17
X18
X19
X20
X21
X22
X23
X24
X25
X26
X27
R5 3.9K
R9 680
R6 3.9K
R10 680
R7 39K
R8 39K
R11 6.8K
R12 6.8K
R13 120K
C1 0.022
C2 0.022
R1 5.6K
R2 5.6K
R3 68
R4 68
R37 22K
R38 2.2K
R15 470K
R16 470K
R17 470K
R18 470K
C3 4.7/25(NP)
C4 4.7/25(N.P)
R32 27
R33 27
R23 330
R24 330
R25 4.7K
R26 4.7K
R27 4.7K
R28 4.7K
R19 270
R14 680
R34 0.68 (1W)
R20 270
R31 560
R21 270
R22 270
R29 330
R30 330
I O DRUM MDA
11
12
4
6
5
7
8
10
9
2
3
1
14
13
FG
FG
COIL-11
HG-14
HG-12
HG-11
HG-13
COIL-12
COIL-21
HG-24
HG-22
HG-21
HG-23
COIL-22
HG-1
HG-2
COIL-1
COIL-2

NOTES:

1. Unless otherwise specified;
   All NPN transistors are 2SC2785H
   All PNP transistors are 2SA1175H
   All resistance values are in ohms, 1/8 W.
   All capacitance values are in μF.
   X14 – X17 2SB772R
   X18 – X21 2SD882E
   X27 2SC2259FG
   X3,X4,X26 2SA1175JHFE
   X13 2SC2785JHFE
2. Voltages are DC-measured with a digital voltmeter during recording mode.

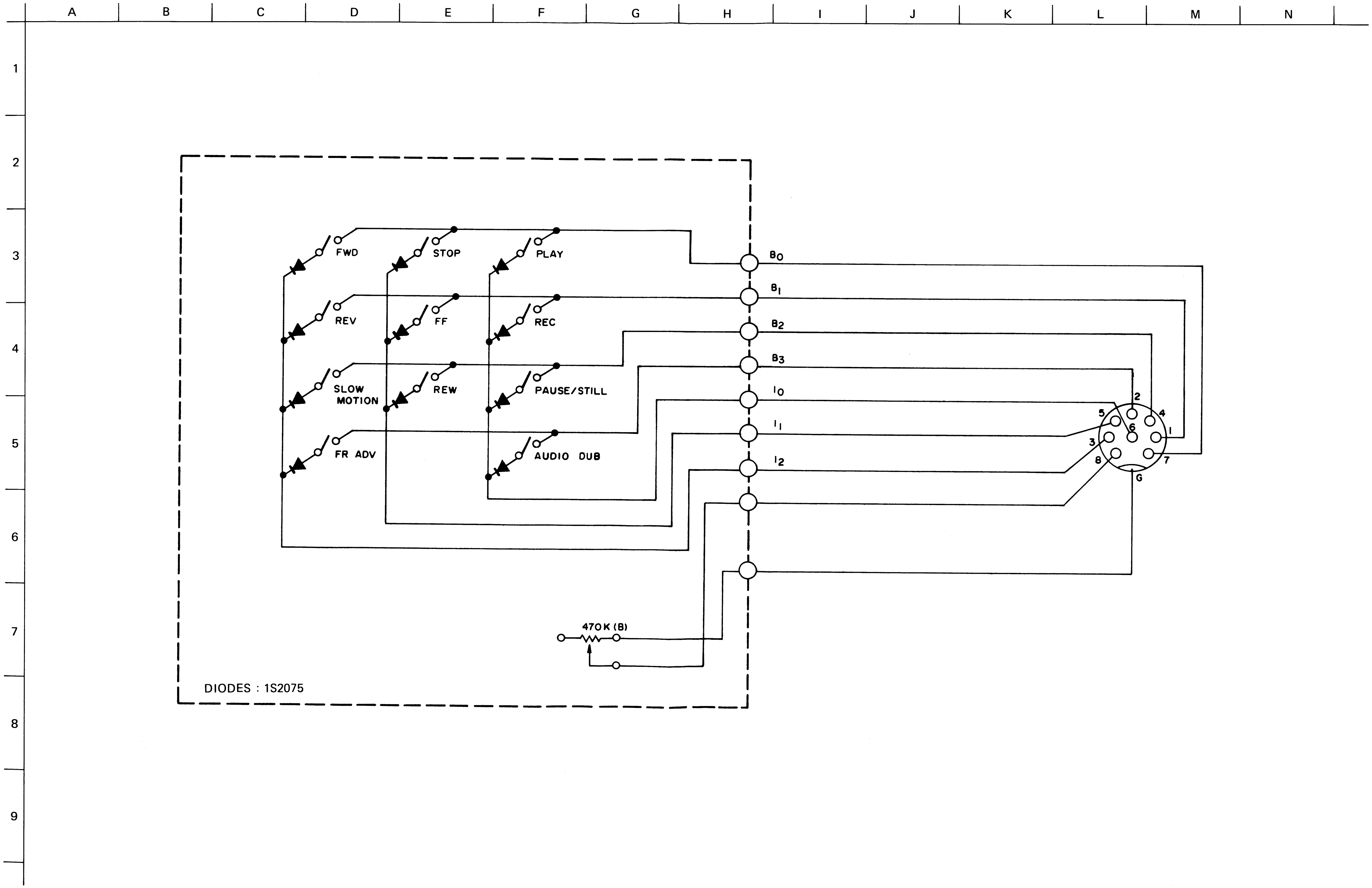
8.27 MOTOR DRIVE AMPLIFIER (MDA) CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
R27
J2
R4
R3
R2
R38
X10
X11
X9
X12
X7
X6
X8
X5
R12
C2
X26
R11
R35
X2
C1
R1
R36
R14
R28
J1
R26
R25
R31
X27
X3
X1
X13
R13
R5
R9
R7
R34
R37
R8
X4
R10
R6
X19
R19
X18
X22
X23
X24
R22
R21
R17
R15
X14
R20
R16
X15
X20
X16
X21
C3
C4
R32
R33
X17
X25
R48
R29
R30
R23
R24
27
21
14
7
1
J
B
C
E

NOTE:
"Chip" parts are indicated by rectangles ☐
Examples:

R21 : Chip resistor
R34 : Conventional resistor
J : Jumper (i.e, 0 ohm resistor)

9.28 REMOTE CONTROL UNIT SCHEMATIC DIAGRAM

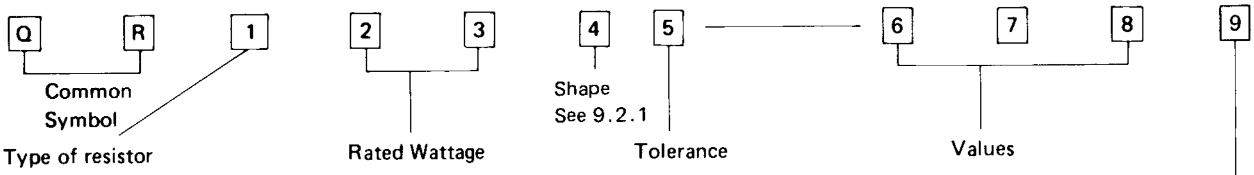

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
FWD
STOP
PLAY
B0
B1
REV
FF
REC
B2
B3
SLOW MOTION
REW
PAUSE/STILL
I0
2
5
4
6
I1
1
FR ADV
AUDIO DUB
3
8
7
I2
G
470K (B)
DIODES : 1S2075

SECTION 9
ELECTRICAL PARTS LIST

9.1 SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

9.2 FIXED RESISTOR CODING


Q
R
1
2
3
4
5
6
7
8
9
Common Symbol
Type of resistor
Rated Wattage
Shape See 9.2.1
Tolerance
Values

C	Composition Resistor
D	Carbon Resistor
F	Unflamable Resistor
G	Oxide Metal Film Resistor
M	Metal Plate Resistor
X	Metal Film Resistor
W	Wire Wound Resistor
Y	Wire Wound Resistor
V	Metal Film Resistor, High Stability
Z	Special Resistor

Symbol	Rated wattage
16	1/6 (W)
18	1/8 "
14	1/4 "
12	1/2 "
01	1 "
02	2 "
03	3 "
04	4 "
05	5 "
06	6 "
07	7 "
75	7.5 "
08	8 "
10	10 "
15	15 "
20	20 "
30	30 "

Symbol	Tolerance
F	±1 %
G	±2 %
J	±5 %
K	±10 %
M	±20 %

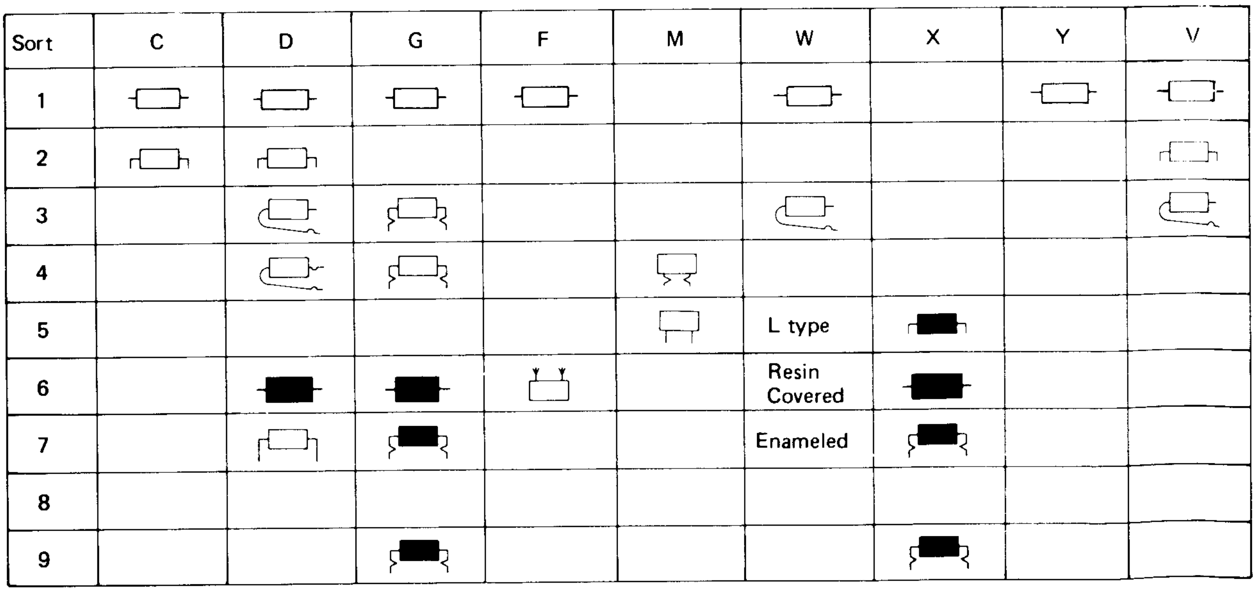
– Example –

R47	....	0.47 Ω
4R7	....	4.7 Ω
470	......47×10^0	47 Ω
471	......47×10^1	470 Ω
472	......47×10^2	4.7 KΩ
473	......47×10^3	47 KΩ
474	......47×10^4	470 KΩ
475	......47×10^5	4.7 MΩ
10R2	....	10.2 Ω
1430	... 143×10^0	143 Ω
1581	... 158×10^1	1.58 KΩ

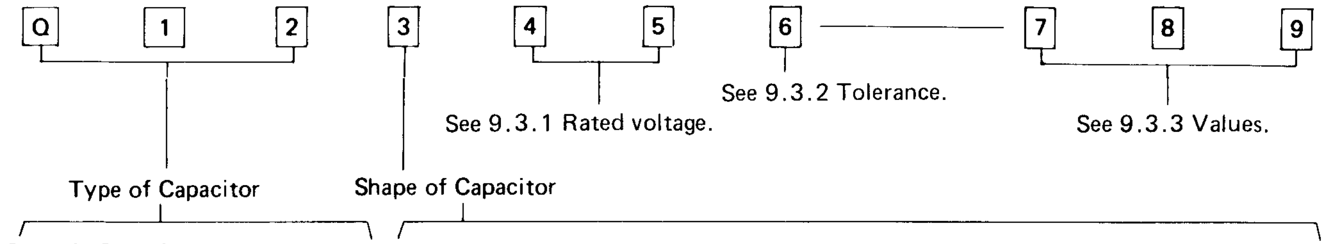
Size

Symbol	Size
A	Small Size
S	Small Size

9.2.1 Shape of resistor (■: Flame retardant resistor)


Sort
C
D
G
F
M
W
X
Y
V
1
2
3
4
5
6
7
8
9
L type
Resin Covered
Enameled

9.3 FIXED CAPACITOR CODING


Q
1
2
3
4
5
6
7
8
9
See 9.3.1 Rated voltage.
See 9.3.2 Tolerance.
See 9.3.3 Values.
Type of Capacitor
Shape of Capacitor

Ceramic Capacitors

Symbol	Type of Capacitor	Disk Lead	Kink Lead	
QCF	Ceramic	1	3	
QCS	"	1	3	
QCY	"	1, 4	3	
QCT	Temperature compensation			
QCZ	Special			

Electrolytic Capacitors

Symbol	Type of Capacitor	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEA	Characteristic A	2	4			
QED	Characteristic D	2	4			
QEE	Tantalum		4	5		
QEE	" (small type)		8			
QEN	Non-polar	2	4	5	6	
QET	Characteristic W (small type)	2	4	5	6	
QEW	Characteristic W	2	4	5	6	7
QEZ	Special					

Paper Film Capacitors

Symbol	Type of Capacitor	Tubular	Normal		Flame retardant	
			Mono-direction	Kink Lead	Mono-direction	Kink Lead
QFF	Film mica		4			
QFH	Metalized mylar	2	4	3	5	6
QFM	Mylar	2	4	3, 7	5	6
QFN	" (small type)		4			
QFP	Polypropylene		4	3		
QFS	Polystyrole	2	4	3		
QFZ	Special					

9.3.1 Rated voltage

2nd letter First letter	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15			6.3				
1	10		16	20	25		40	50	63		35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

9.3.2 Tolerance

Symbol	F	G	J	K	M	Z	P	A	H	R
(%)	±1	±2	±5	±10	±20	+80 -20	+100 - 0	+100 - 10	+50 -10	+30 -10

9.3.3 Values

– Example – Values are in picofarads.

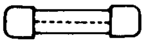
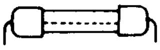
4R7 ....4.7 pF
470 ...... 47 x 10^0 ...... 47 pF
471 ...... 47 x 10^1 ...... 470 pF
472 ...... 47 x 10^2 ...... 4,700 pF = 0.0047 μF
473 ...... 47 x 10^3 ...... 47,000 pF = 0.047 μF

9.4 FUSE CODING

Q M F 1 2 3 4 — 5 6 7

COMMON SYMBOL

Shape of Fuse

Symbol No.	Shape	Remarks
51		ϕ 5.2 x 20
60		ϕ 6.4 x 30
61		ϕ 6.35 x 31.8
63		With 60 Lead Wire
66		With 61 Lead Wire

Rated Voltage

Symbol No.	Rated Voltage
1	AC 125 V
2	AC 250 V

Values

R10	0.1 A
R125	0.125 A
1R0	1.0 A
1R2	1.2 A
1R25	1.25 A
100	10 A

Characteristics

Symbol No.	Fusing current	Fusing time	Remarks
S	160%	Within 1 hr.	Anti-rush Type
	200%	" 2 min.	
	700%–2000%	" 0.01 sec.	
R	160%	" 1 hr.	Regular Fusible Type
	200%	" 2 min.	
M	135%	" 1 hr.	Regular Fusible Type (for UL)
	200%	" 2 min.	
U	135%	" 1 hr.	Anti-rush Type (for UL)
	200%	" 2 min.	
	800%–2000%	" 0.01 sec.	
A	210%	" 2 min.	Anti-rush Type (for Europe)
	275%	0.5 – 10 sec.	
	400%	0.15 – 2 sec.	
	1000%	0.02 – 0.3 sec.	
B	210%	Within 30 min.	Regular Fusible Type (for SEMKO, Europe)
	275%	0.05 – 2 sec.	
	400%	0.01 – 0.3 sec.	

9.5 ELECTRICAL PARTS LIST BY ASSEMBLIES

9.5.1 Audio & CPU Ass'y PU49174G

Symbol No.	Part No.	Part Name	Description
IC 1	HA12005	IC	
IC 2	NJM4556D	"	
IC 3	NJM2903D	"	
IC 4	UPD553C-066	"	
IC 5	TC4015BP	CMOS IC	
IC 6	TC4050BP	"	
X 1	2SD958TU	Transistor	
X 2	"	"	
X 3	2SB788TU	"	
X 4	–	–	
X 5	2SD661TU	Transistor	
X 6	"	"	
X 7	"	"	
X 8	"	"	
X 9	2SD637Q,R	"	
X10	–	–	
X11	2SC2647C	Transistor	
X12	2SC2655Y	"	
X13	"	"	
X14	2SB788TU	"	
X15	2SA874Q,R	"	
X16	2SA1020-OY	"	
X17	2SC2655-OY	"	
X18	2SA1020-OY	"	
X19	2SC2655-OY	"	
X20	2SC2647C	"	
X21	2SA1020-OY	"	
X22	2SC2655-OY	"	
X23	2SD947M	"	
X24	2SC2655-OY	"	
X25	2SD947M	"	
X26	2SC2655-OY	"	
X27	2SA1020-OY	"	
X28	2SC2655-OY	"	
X29	2SC2647C	"	
X30	2SA874Q,R	"	
X31	2SC2647C	"	
D 1	1SS133HV	Diode	
D 2	–	–	
D 3	VO3C	Diode	
D 4	1SS133HV	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
D 8	"	"	
D 9	–	–	
D10	–	–	
D11	–	–	
D12	1SS133HV	Diode	
D13	"	"	
D14	RD2.7EB1	Zener Diode	
D15	1SS133HV	Diode	
D16	"	"	
D17	VO3C	"	
D18	–	–	
D19	1SS133HV	Diode	
D20	"	"	
D21	"	"	
D22	"	"	
D23	"	"	

Symbol No.	Part No.	Part Name	Description
R 1	QRD181J-392A	CR	3.9 K 1/8 W, J
R 2	" -102A	"	1 K " "
R 3	QRD187J-473A	"	47 K " "
R 4	QRD181J-221A	"	220 " "
R 5	" -101A	"	100 " "
R 6	" -223A	"	22 K " "
⚠ R 7	QRZ0054-101	FR	100
R 8	–	–	–
R 9	QRD181J-103A	CR	10 K 1/8 W,J
R10	" -472A	"	4.7 K " "
R11	" -103A	"	10 K " "
R12	" -562A	"	5.6 K " "
R13	" -562A	"	5.6 K " "
R14	QRD187J-562A	"	5.6 K " "
R15	" -562A	"	5.6 K " "
R16	QRD181J-222A	"	2.2 K " "
R17	QRD187J-103A	"	10 K " "
R18	QRD181J-224A	"	220 K " "
R19	" -223A	"	22 K " "
R20	" -332A	"	3.3 K " "
R21	QRD187J-332A	"	3.3 K " "
R22	–	–	–
R23	QRD181J-682A	CR	6.8 K 1/8 W, J
R24	" -271A	"	270 " "
R25	" -153A	"	15 K " "
R26	" -682A	"	6.8 K " "
R27	" -473A	"	4.7 K " "
R28	" -104A	"	100 K " "
R29	" -332A	"	3.3 K " "
R30	" -332A	"	3.3 K " "
R31	" -104A	"	100 K " "
R32	" -103A	"	10 K " "
R33	QRD187J-101A	"	100 " "
R34	QRD181J-184A	"	180 K " "
R35	" -681A	"	680 " "
R36	QVZ3507-104	VR	100 K
R37	QRD181J-122A	CR	1.2 K 1/8 W, J
R38	" -473A	"	47 K " "
R39	" -182A	"	1.8 K " "
R40	" -153A	"	15 K " "
R41	" -223A	"	22 K " "
R42	" -332A	"	3.3 K " "
R43	QVZ3507-223	VR	22 K
R44	QRD181J-471A	CR	470 1/8 W, J
R45	QVZ3507-473	VR	47 K
R46	–	–	
R47	–	–	
R48	–	–	
R49	–	–	
R50	–	–	
R51	QRD181J-393A	CR	39 K 1/8 W, J
R52	" -473A	"	47 K " "
R53	" -221A	"	220 " "
R54	QRD187J-102A	"	1 K " "
R55	QRD181J-103A	"	10 K " "
R56	" -222A	"	2.2 K " "
R57	" -223A	CR	22 K " "
R58	" -102A	"	1 K " "
R59	" -103A	"	10 K " "
R60	" -152A	"	1.5 K " "
R61	" -393A	"	39 K " "
R62	" -473A	"	47 K " "
R63	" -222A	"	2.2 K " "

Symbol No.	Part No.	Part Name	Description
R64	QRD181J-104A	CR	100 K 1/8 W, J
R65	″ -103A	″	10 K ″ ″
R66	″ -102A	″	1 K ″ ″
R67	″ -101A	″	100 ″ ″
R68	″ -101A	″	100 ″ ″
R69	″ -471A	″	470 ″ ″
R70	″ -824A	″	820 K ″ ″
R71	″ -105A	″	1 M ″ ″
R72	″ -561A	″	560 ″ ″
R73	QRD187J-561A	″	560 ″ ″
⚠R74	QRZ0054-100	FR	10
R75	QRD181J-103A	CR	10 K 1/8 W, J
R76	″ -332A	″	3.3 K ″ ″
R77	″ -103A	″	10 K ″ ″
R78	″ -103A	″	10 K ″ ″
R79	″ -472A	″	4.7 K ″ ″
R80	″ -103A	″	10 K ″ ″
R81	QVZ3507-224	VR	220 K
R82	QRD181J-471A	CR	470 1/8 W, J
R83	QRD187J-101A	″	100 ″ ″
R84	–	–	
R85	–	–	
R86	–	–	
R87	–	–	
R88	–	–	
R89	–	–	
R90	QRD181J-152A	CR	1.5 K 1/8 W, J
R91	″ -223A	″	22 K ″ ″
R92	″ -223A	″	22 K ″ ″
R93	″ -102A	″	1 K ″ ″
R94	″ -102A	″	1 K ″ ″
R95	″ -152A	″	1.5 K ″ ″
R96	″ -223A	″	22 K ″ ″
R97	QRD187J-223A	″	22 K ″ ″
R98	QRD181J-103A	″	10 K ″ ″
R99	″ -223A	″	22 K ″ ″
R100	″ -223A	″	22 K ″ ″
R101	QRD187J-561A	″	560 ″ ″
R102	QRD181J-561A	″	560 ″ ″
R103	QRD181J-223A	″	22 K ″ ″
R104	″ -222A	″	2.2 K ″ ″
R105	″ -103A	″	10 K ″ ″
R106	″ -223A	″	22 K ″ ″
R107	QRD187J-561A	″	560 ″ ″
R108	QRD181J-222A	″	2.2 K ″ ″
R109	″ -103A	″	10 K ″ ″
R110	″ -223A	″	22 K ″ ″
R111	″ -561A	″	560 ″ ″
R112	″ -223A	″	22 K ″ ″
R113	″ -561A	″	560 ″ ″
R114	″ -223A	″	22 K ″ ″
R115	″ -561A	″	560 ″ ″
R116	″ -103A	″	10 K ″ ″
R117	″ -223A	″	22 K ″ ″
R118	QRD183J-473A	″	47 K ″ ″
R119	″ -333A	″	33 K ″ ″
R120	″ -333A	″	33 K ″ ″
R121	–	–	
R122	–	–	
R123	QRD183J-103A	CR	10 K 1/8 W, J
R124	QRD181J-223A	″	22 K ″ ″
R125	–	–	
R126	–	–	

Symbol No.	Part No.	Part Name	Description
R127	–	–	
R128	–	–	
R129	–	–	
R130	EXB-P86333M	Resistor Array	33 K X6
R131	″ -P86333M	″	33 K X6
R132	″ -P86472M	″	4.7 K X6
R133	″ -P88333M	″	33 K X8
R134	QRD181J-103A	CR	10 K 1/8 W, J
R135	″ -102A	″	1 K ″ ″
R136	″ -102A	″	1 K ″ ″
R137	″ -102A	″	1 K ″ ″
R138	″ -102A	″	1 K ″ ″
R139	″ -102A	″	1 K ″ ″
R140	″ -102A	″	1 K ″ ″
R141	QRD187J-102A	″	1 K ″ ″
R142	″ -333A	″	33 K ″ ″
R143	QRD183J-392A	″	3.9 K ″ ″
R144	QRD187J-333A	″	33 K ″ ″
R145	QRD181J-103A	″	10 K ″ ″
R146	″ -102A	″	1 K ″ ″
R147	″ -102A	″	1 K ″ ″
R148	″ -102A	″	1 K ″ ″
R149	″ -222A	″	2.2 K ″ ″
R150	″ -102A	″	1 K ″ ″
R151	″ -102A	″	1 K ″ ″
R152	″ -473A	″	47 K ″ ″
R153	″ -103A	″	10 K ″ ″
R154	QRD187J-562A	″	5.6 K ″ ″
R155	–	–	
R156	–	–	
R157	–	–	
R158	–	–	
R159	QRD187J-222A	CR	2.2 K 1/8 W, J
R160	QRD181J-221A	″	220 ″ ″
R161	QRD187J-103A	″	10 K ″ ″
R162	″ -333A	″	33 K ″ ″
R163	″ -683A	″	68 K ″ ″
R164	QRD181J-104A	″	100 K ″ ″
R165	″ -104A	″	100 K ″ ″
R166	″ -104A	″	100 K ″ ″
R167	″ -104A	″	100 K ″ ″
R168	″ -222A	″	2.2 K ″ ″
C 1	QEN41CM-106	NP Cap	10 16 V
C 2	QFN41HK-102	MY Cap	0.001 50 V
C 3	QEK41EM-475	E Cap	4.7 25 V
C 4	QEK41CM-106	″	10 16 V
C 5	″ -106	″	10 ″
C 6	QFN41HK-471	MY Cap	470 P 50 V
C 7	QFN41HK-103	″	0.01 ″
C 8	QEK40JM-476	E Cap	47 6.3 V
C 9	QEK41CM-106M	″	10 16 V
C10	QEN41CM-106	NP Cap	10 ″
C11	QEK41CM-106M	E Cap	10 ″
C12	QFN41HK-272	MY Cap	0.0027 50 V
C13	QEK40JM-107	E Cap	100 6.3 V
C14	″ -476M	″	47 ″
C15	QCS31HK-101	C Cap	100 P 50 V
C16	QFN41HK-102	MY Cap	0.001 ″
C17	″ -102	″	0.001 ″
C18	QEK40JM-226	E Cap	22 6.3 V
C19	QFN41HK-154	MY Cap	0.15 50 V

Symbol No.	Part No.	Part Name	Description
C20	QFN41HK-102	MY Cap	0.001 50 V
C21	" -102	"	0.001 "
C22	" -152	"	0.0015 "
C23	QEK41EM-335	E Cap	3.3 25 V
C24	QEK41CM-106M	"	10 16 V
C25	QFN41HK-152	MY Cap	0.0015 50 V
C26	–	–	
C27	QEK41CM-106M	E Cap	10 16 V
C28	QCS31HK-221	C Cap	220 P 50 V
C29	QEK41CM-106M	E Cap	10 16 V
C30	QEK41HM-224M	"	0.22 50 V
C31	QEK41CM-106M	"	10 16 V
C32	QEK41AM-476M	"	47 10 V
C33	" -476	"	47 "
C34	QET41CR-107	"	100 16 V
C35	" -107	"	100 "
C36	QFN41HK-561	MY Cap	560 P 50 V
C37	–	–	
C38	–	–	
C39	–	–	
C40	–	–	
C41	QFN41HK-333	MY Cap	0.033 50 V
C42	QEK41CM-106	E Cap	10 16 V
C43	QEK41EM-475	"	4.7 25 V
C44	QCS31HK-271	C Cap	270 P 50 V
C45	QFN41HK-152	MY Cap	0.0015 "
C46	QEK40JM-336	E Cap	33 6.3 V
C47	QEK41CM-106	"	10 16 V
C48	" -106	"	10 "
C49	QEK40JM-107	"	100 6.3 V
C50	QFN41HK-103	MY Cap	0.01 50 V
C51	QEK41CM-106	E Cap	10 16 V
C52	QFP32XK-682	PP Cap	0.0068 600 V
C53	QEK41CM-106	E Cap	10 16 V
C54	QFN41HK-153	MY Cap	0.015 50 V
C55	" -153	"	0.015 "
C56	" -103	"	0.01 "
C57	" -103	"	0.01 "
C58	QEK41CM-106	E Cap	10 16 V
C59	QFS42BK-561	PS Cap	560 P 125 V
C60	QEK41CM-106	E Cap	10 16 V
C61	" -106	"	10 "
C62	QFN41HK-103	MY Cap	0.01 50 V
C63	–	–	
C64	–	–	
C65	–	–	
C66	–	–	
C67	–	–	
C68	–	–	
C69	–	–	
C70	QEK41CM-106	E Cap	10 16 V
C71	QCS31HK-101	C Cap	100 P 50 V
C72	" -101	"	100 P "
C73	QEE41EM-335	T Cap	3.3 25 V
C74	QEK41HM-105	E Cap	1 50 V
C75	–	–	
C76	QEK41EM-335	E Cap	3.3 25 V
C77	QET41CR-107	"	100 16 V
L 1	PU49543	Inductor	8.2 mH
L 2	"	"	"
L 3	T40442-001	"	

Symbol No.	Part No.	Part Name	Description
L 4	PU49176	OSC Coil	
L 5	PU40010-102	Peaking Coil	
L 6	A04725-220	"	
RL 1	PU49175	DC Relay	(for AF REC)
	PU50224	Ceramic Filter	CSB-400P
V 1	PU49624	Varistor	
CN 1	PU49215-4	Cap. Housing	for SW
CN 2	" -2R	"	for Motor
CN 3	PU49217-20	Recep. Housing	20 pin
CN 4	PU49215-4R	Cap. Housing	for L.M. & Brake
CN 5	" -2Y	"	for Pinch Sol.
CN 6	PU49217-15	Recep. Housing	–
CN 7	PU43351-3	Cap. Housing	for Mic.
CN 8	" -3Y	"	for R/PH
CN 9	PU49215-4Y	"	for A.E. & CTL H.
CN10	" -2	"	for F.E.
CN11	PU43351-2	"	for Heater
CN12	PU50355-18	"	18 pin
CN13	" -18	"	18 pin
	PU46649	Test Point	
	PU50383	Earth Plate	

9.5.2 Mechanism Control Ass'y PU49531G

Symbol No.	Part No.	Part Name	Description
IC 1	TC4512BP	IC	
IC 2	″	″	
IC 3	TC4015BP	″	
IC 4	UPA2004C	″	
IC 5	NJM2901N	″	
X 1	2SC2063PQ	Transistor	
X 2	2SC1881K	″	
X 3	2SC2063QR	″	
X 4	–	–	
X 5	–	–	
X 6	2SC2673PQ	Transistor	
X 7	2SC2063PQ	″	
X 8	″	″	
X 9	″	″	
X10	2SC2063QR	″	
X11	2SC2063PQ	″	
X12	″	″	
X13	2SC2063QR	″	
X14	2SD1055PQ	″	
X15	–	–	
X16	2SC2063P,Q	Transistor	
X17	2SA786Q	″	
X18	2SC2063QR	″	
X19	2SC2063PQ	″	
X20	2SA786Q	″	
X21	2SC2063PQ	″	
D 1	PR3402S	LED	
D 2	″	″	
D 3	″	″	
D 4	″	″	
D 5	″	″	
D 6	″	″	
D 7	″	″	
D 8	″	″	
D 9	″	″	
D10	″	″	
D11	1SS133HV	Diode	
D12	″	″	
D13	″	″	
D14	″	″	
D15	″	″	
D16	″	″	
D17	″	″	
D18	″	″	
D19	″	″	
D20	″	″	
D21	″	″	
D22	″	″	
D23	″	″	
D24	″	″	
D25	″	″	
D26	″	″	
D27	″	″	
D28	″	″	
D29	″	″	
D30	″	″	
D31	″	″	
D32	″	″	
D33	″	″	

Symbol No.	Part No.	Part Name	Description
D34	OA 90	Diode	
D35	–	–	
D36	RD12EB1	Zener Diode	
R 1	QRD181J-102A	CR	1 K 1/8 W, J
R 2	″ -102A	″	1 K ″ ″
R 3	″ -102A	″	1 K ″ ″
R 4	″ -102A	″	1 K ″ ″
R 5	″ -102A	″	1 K ″ ″
R 6	″ -102A	″	1 K ″ ″
R 7	″ -102A	″	1 K ″ ″
R 8	″ -104A	″	100 K ″ ″
R 9	″ -333A	″	33 K ″ ″
R10	″ -333A	″	33 K ″ ″
R11	″ -334A	″	330 K ″ ″
R12	″ -103A	″	10 K ″ ″
R13	QVZ3507-474	VR	470 K
R14	″ -474	″	470 K
R15	QRD181J-103A	CR	10 K 1/8 W, J
R16	QRD181J-103A	CR	10 K ″ ″
R17	″ -561A	″	560 ″ ″
R18	″ -334A	″	330 K ″ ″
R19	″ -334A	″	330 K ″ ″
R20	″ -334A	″	330 K ″ ″
R21	″ -224A	″	220 K ″ ″
R22	″ -104A	″	100 K ″ ″
R23	″ -105A	″	1 M ″ ″
R24	–	–	–
R25	–	–	–
R26	QRD181J-333A	CR	33 K 1/8 W, J
R27	″ -333A	″	33 K ″ ″
R28	″ -333A	″	33 K ″ ″
R29	″ -333A	″	33 K ″ ″
R30	″ -333A	″	33 K ″ ″
R31	″ -103A	″	10 K ″ ″
R32	″ -562A	″	5.6 K ″ ″
R33	″ -333A	″	33 K ″ ″
R34	″ -473A	″	47 K ″ ″
R35	″ -333A	″	33 K ″ ″
R36	″ -104A	″	100 K ″ ″
R37	″ -103A	″	10 K ″ ″
R38	″ -333A	″	33 K ″ ″
R39	″ -224A	″	220 K ″ ″
R40	″ -224A	″	220 K ″ ″
R41	″ -102A	″	1 K ″ ″
R42	″ -333A	″	33 K ″ ″
R43	″ -222	″	2.2 K 1/4 W, J
R44	″ -333A	″	33 K 1/8 W, J
R45	QVZ3506-472	VR	4.7 K
R46	QRD181J-223A	CR	22 K 1/8 W, J
R47	″ -223A	″	22 K ″ ″
R48	QVZ3506-472	VR	4.7 K
R49	QRD181J-223A	CR	22 K 1/8 W, J
R50	″ -102A	″	1 K ″ ″
R51	″ -823A	″	82 K ″ ″
R52	″ -104A	″	100 K ″ ″
R53	″ -103A	″	10 K ″ ″
R54	″ -104	″	100 K ″ ″
R55	″ -331A	″	330 ″ ″
R56	″ -684A	″	680 K ″ ″
R57	″ -334A	″	330 K ″ ″
R58	″ -334A	″	330 K ″ ″

Symbol No.	Part No.	Part Name	Description
R59	QRD181J-333A	CR	33 K 1/8 W, J
R60	" -104A	"	100 K " "
R61	" -103A	"	10 K " "
R62	QRD141J-150	"	15 1/4 W, J
R63	QRD181J-103A	"	10 K 1/8 W, J
R64	" -822A	"	8.2 K " "
R65	" -823A	"	82 K " "
R66	" -104A	"	100 K " "
R67	" -183A	"	18 K " "
R68	" -563A	"	56 K " "
R69	" -103A	"	10 K " "
R70	" -333A	"	33 K " "
R71	" -333A	"	33 K " "
R72	" -333A	"	33 K " "
R73	" -333A	"	33 K " "
R74	" -393A	"	39 K " "
R75	" -473A	"	47 K " "
R76	" -102A	"	1 K " "
R77	" -103A	"	10 K " "
R78	" -333A	"	33 K " "
R79	" -334A	"	330 K " "
R80	" -103A	"	10 K " "
R81	" -333A	"	33 K " "
R82	" -184A	"	180 K " "
R83	" -184A	"	180 K " "
R84	" -103A	"	10 K " "
R85	" -223A	"	22 K " "
R86	" -224A	"	220 K " "
R87	–	–	
R88	QRD181J-223A	CR	22 K 1/8 W, J
R89	" -103A	"	10 K " "
R90	" -152A	"	1.5 K " "
R91	" -103A	"	10 K " "
R92	" -103A	"	10 K " "
R93	" -393A	"	39 K " "
R94	" -223A	"	22 K " "
R95	" -103A	"	10 K " "
R96	" -102A	"	1 K " "
R97	" -223A	"	22 K " "
R98	" -563A	"	56 K " "
R99	" -334A	"	330 K " "
R100	" -473A	"	47 K " "
R101	" -223A	"	22 K " "
R102	QRD121J-820	"	82 1/2 W, J
R103	QRD187J-123A	"	12 K 1/8 W, J
R104	QRD181J-332A	"	3.3 K " "
R105	" -332A	"	3.3 K " "
C 1	QEK41CM-476	E Cap	47 16 V
C 2	QET41CR-107	"	100 "
C 3	QEE41VM-154	T Cap	0.15 35 V
C 4	" -154	"	0.15 "
C 5	QEK41HM-105	E Cap	1 50 V
C 6	QEK41CM-336	"	33 16 V
C 7	" -336	"	33 "
C 8	" -336	"	33 "
C 9	" -336	"	33 "
C10	QCF31HP-103	C Cap	0.01 50 V
C11	PU49527	Gold Cap	3.3 F 1.6 V
C12	QEK41HM-474	E Cap	0.47 50 V
C13	" -474	"	0.47 "
C14	QCF31HP-103	C Cap	0.01 "
C15	QEK41CM-106	E Cap	10 16 V
C16	QEK41CM-106	"	10 "

Symbol No.	Part No.	Part Name	Description
C17	QEK40JM-226	E Cap	22 6.3 V
C18	QEK41CM-336	"	33 16 V
C19	QEK41CM-106	"	10 "
C20	QEN41HM-105	NP Cap	1 50 V
C21	QEE41CM-106	T Cap	10 16 V
C22	–	–	
C23	QCS31HK-101	C Cap	100 P 50 V
C24	QFN41HK-102	MY Cap	0.001 "
C25	QCS31HK-221	C Cap	220 P 50 V
C26	QEK41EM-225	E Cap	2.2 25 V
C27	" -225	"	2.2 "
SW 4	PU49344	Push Switch	
SW 5	"	"	
SW 6	"	"	
SW 7	"	"	
SW 8	"	"	
SW 9	"	"	
SW10	"	"	
SW11	"	"	
SW12	"	"	
V 1	PU49624	Varistor	
	S8018V	LCD Counter	
	PU49596	LED Holder	
	PU49058	Counter Bracket	
	SPSP2006Z	Screw	
	SDSP2004Z	Screw	
	PU49256	Connector Board Ass'y (1)	
	SBSE3006Z	Tapping Screw	
SW13	PU49617	Leaf Switch	REC SAFETY
	SBSE2612Z	Tapping Screw	
	PU49247	Switch Holder	
	SBSE2608Z	Tapping Screw	
	PU50040	Radiation Plate	for X2
	DPSP3006ZS	Screw	
CN 1	PU49215-2Y	Cap Housing	
CN 2	" -3	"	
CN 3	" -4Y	"	
CN 4	" -4	"	
CN 5	PU50356-18	Pin Header	
CN 6	" -18	"	
	PU49668	PC Joiner	for LCD counter

9.5.3 Pre/Record Amp. Ass'y PU49526B

Symbol No.	Part No.	Part Name	Description
IC 1	HA11716	IC	
X 1	2SC2063QR	Transister	
X 2	″	″	
X 3	2SA786Q	″	
X 4	2SA874Q	″	
X 5	2SC1652Q	″	
X 6	″	″	
X 7	2SA874Q	″	
X 8	2SC2063QR	″	
X 9	″	″	
X10	2SC828Q	″	
X11	″	″	
X12	2SC2063QR	″	
X13	″	″	
X14	″	″	
X15	″	″	
X16	″	″	
D 1	–	–	
D 2	1SS133HV	Diode	
D 3	″	″	
R 1	QVZ3506-102	VR	1 K
R 2	″ -102	″	1 K
R 3	QRD181J-102A	CR	1 K 1/8 W, J
R 4	″ -222A	″	2.2 K ″ ″
R 5	″ -682A	″	6.8 K ″ ″
R 6	″ -224A	″	220 K ″ ″
R 7	–	–	–
R 8	QRD181J-273A	CR	27 K 1/8 W, J
R 9	″ -822A	″	8.2 K ″ ″
R10	″ -561A	″	560 ″ ″
R11	″ -220A	″	22 ″ ″
R12	″ -102A	″	1 K ″ ″
R13	″ -122A	″	1.2 K ″ ″
R14	″ -562A	″	5.6 K ″ ″
R15	″ -562A	″	5.6 K ″ ″
R16	″ -122A	″	1.2 K ″ ″
R17	QRX129J-100	MFR	10 1/2 W, J
R18	QRD181J-100A	CR	10 1/8 W, J
R19	QRX129J-4R7	MFR	4.7 1/2 W, J
R20	″ -4R7	″	4.7 ″ ″
R21	QRD181J-562A	CR	5.6 K 1/8 W, J
R22	″ -682A	″	6.8 K ″ ″
R23	″ -180A	″	18 ″ ″
R24	QVZ3506-101	VR	100
R25	QRD181J-100A	CR	10 1/8 W, J
R26	″ -470A	″	47 ″ ″
R27	QRD187J-3R9A	″	3.9 ″ ″
R28	QRD181J-3R9A	″	3.9 ″ ″
R29	″ -272A	″	2.7 K ″ ″
R30	″ -272A	″	2.7 K ″ ″
R31	″ -272A	″	2.7 K ″ ″
R32	″ -272A	″	2.7 K ″ ″
R33	″ -331A	″	330 ″ ″
R34	″ -331A	″	330 ″ ″
R35	QVZ3506-103	VR	10 K
R36	″ -103	″	10 K
R37	QRD181J-103A	CR	10 K 1/8 W, J
R38	″ -103A	″	10 K ″ ″
R39	QRD181J-222A	CR	2.2 K 1/8 W, J
R40	″ -182A	″	1.8 K ″ ″
R41	″ -102A	″	1 K ″ ″
R42	″ -272A	″	2.7 K ″ ″
R43	″ -391A	″	390 ″ ″
R44	″ -391A	″	390 ″ ″
R45	″ -102A	″	1 K ″ ″
R46	″ -152A	″	1.5 K ″ ″
R47	QRD142J-221	CR	220 1/4 W, J
R48	QRD181J-103A	″	10 K 1/8 W, J
R49	″ -222A	″	2.2 K ″ ″
R50	″ -102A	″	1 K ″ ″
R51	QVZ3506-102	VR	1 K
R52	QRD181J-104A	CR	100 K 1/8 W, J
R53	″ -332A	″	3.3 K ″ ″
R54	″ -101A	″	100 ″ ″
R55	″ -102A	″	1 K ″ ″
R56	″ -102A	″	1 K ″ ″
R57	″ -221A	″	220 ″ ″
R58	″ -822A	″	8.2 K ″ ″
R59	″ -562A	″	5.6 K ″ ″
R60	″ -182A	″	1.8 K ″ ″
R61	″ -222A	″	2.2 K ″ ″
R62	″ -122A	″	1.2 K ″ ″
R63	″ -391A	″	390 ″ ″
R64	″ -681A	″	680 ″ ″
R65	″ -221A	″	220 ″ ″
R66	″ -103A	″	10 K ″ ″
C 1	QCF11HP-223	C Cap	0.022 50 V
C 2	QET41AR-107	E Cap	100 10 V
C 3	–	–	–
C 4	QFN41HJ-223	MY Cap	0.022 50 V
C 5	″ -223	″	0.022 ″
C 6	″ -333	″	0.033 ″
C 7	″ -333	″	0.033 ″
C 8	QCS31HJ-100	C Cap	10 P ″
C 9	–	–	–
C10	QFM31HK-392	MY Cap	0.0039 50 V
C11	QEE41CM-106	T Cap	10 16 V
C12	″ -106	″	10 ″
C13	QCF11HP-223	C Cap	0.022 50 V
C14	″ -223	″	0.022 ″
C15	″ -223	″	0.022 ″
C16	″ -223	″	0.022 ″
C17	QAT3001-009	TR Cap	
C18	″ -009	″	
C19	QCS31HT-270	C Cap	27 P 50 V
C20	″ -270	″	27 P ″
C21	QFN41HJ-223	MY Cap	0.022 ″
C22	″ -223	″	0.022 ″
C23	QCF11HP-223	C Cap	0.022 ″
C24	″ -223	″	0.022 ″
C25	QCS11HJ-470	″	47 P ″
C26	QFN41HJ-102	MY Cap	0.001 ″
C27	″ -103	″	0.01 ″
C28	QCS31HJ-121	C Cap	120 P ″
C29	QFN41HJ-103	MY Cap	0.01 ″
C30	″ -103	″	0.01 ″
C31	QCF11HP-223	C Cap	0.022 ″
C32	QEK41HM-474	E Cap	0.47 ″
C33	QEK41CM-106	E Cap	10 16 V
C34	QCF11HP-223	C Cap	0.022 50 V

Symbol No.	Part No.	Part Name	Description
C35	QFN41HJ-223	MY Cap	0.022 50 V
C36	" -562	"	0.0056 "
C37	" -223	"	0.022 "
C38	" -223	"	0.022 "
C39	QEK41HM-105	E Cap	1 "
C40	QEK41CM-336	"	33 16 V
C41	QCF11HP-223	C Cap	0.022 50 V
C42	QFN41HJ-103	MY Cap	0.01 "
C43	" -103	"	0.01 "
C44	QEK41CM-476	E Cap	47 16 V
C45	QCF11HP-223	C Cap	0.022 50 V
C46	QFN41HJ-103	MY Cap	0.01 "
C47	QCS11HJ-150	C Cap	15 P "
C48	QFN41HJ-103	MY Cap	0.01 "
C49	QCS31HJ-121	C Cap	120 P "
C50	–	–	
C51	QFN41HJ-153	MY Cap	0.015 50 V
L 1	PU48530-101K	Peaking Coil	
L 2	" -560K	"	
L 3	" -560K	"	
L 4	" -8R2K	"	
L 5	" -8R2K	"	
L 6	A04096-1000	"	
L 7	PU48530-101K	"	
L 8	A04096-820	"	
L 9	PU48530-680K	"	
L10	" -150K	"	
L11	" -151K	"	
L12	PU30284-61RN	Choke Coil	
LPF 1	PU49464	Low-Pass Filter	
DL 1	PU49466-2	1H Delay Line	
	PU49215-8R	Cap. Housing	11–18
	" -8	"	21–28
	PU49218-6	"	31–36
	PU45908-2	Test Pin	
	A74138	"	
	PU49518	Shield Case (1)	
	PU49519	" (2)	
	PU49520	" (3)	

9.5.4 Chroma Ass'y .... PU49547C(EG)
PU49547D(EK)

Symbol No.	Part No.	Part Name	Description
IC 1	5HC3	Integrated Circuit	
IC 2	HA11710	"	
IC 3	HA11717	"	
IC 4	HA11706	"	
IC 5	–	–	
IC 6	–	–	
IC 7	HA11706	Integrated Circuit	
X 1	2SB566C	Transistor	
X 2	2SA881Q	"	
X 3	2SC2063Q	"	or 2SC2021Q
X 4	2SA881Q	"	
X 5	"	"	
X 6	2SC2063Q	"	or 2SC2021Q
X 7	2SA786Q	"	
X 8	"	"	
X 9	2SC2063Q	" (EG only)	or 2SC2021Q
X10	"	"	"
X11	"	"	"
X12	1SS133	"	"
X13	–	–	
X14	2SC2063Q	Transistor	or 2SC2021Q
X15	2SA786Q	" (EG only)	
D 1	RD6.8EB	Zener Diode	
D 2	1SS133	Diode	
D 3	RD3.9EB	Zener Diode	
D 4	–	–	
D 5	VO3C	Diode	
D 6	1SS133	"	
D 7	"	"	
D 8	"	"	EG only
D 9	"	"	"
D10	OA90	"	
D11	–	–	
D12	OA90	Diode	EG only
D13	RD3.6EB	Zener Diode	
D14	1SS133	Diode	EG only
D15	"	"	
D16	"	"	
D17	"	"	
D18	"	"	EG only
R 1	QRD181J-472AY	CR	4.7 K 1/8 W J
R 2	" -104AY	"	100 K " "
R 3	" -222AY	"	2.2 K " "
R 4	QRD187J-473A	"	47 K " "
R 5	QRD181J-222AY	"	2.2 K " "
R 6	–	–	
R 7	QRD181J-102AY	CR	1 K 1/8 W J
R 8	" -102AY	"	1 K " "
R 9	" -102AY	"	1 K " "
R10	" -102AY	"	1 K " "
R11	" -821AY	"	820 " "
R12	" -102AY	"	1 K " "
R13	" -681AY	"	680 " "
R14	" -561AY	"	560 " "
R15	QRD187J-824A	"	820 K " "
R16	QRD181J-392AY	"	3.9 K " "
R17	QVZ3506-103	VR	10 K

Symbol No.	Part No.	Part Name	Description
R18	ERT-D2FHK-153S	Thermistor	
R19	QRD181J-224AY	CR	220 K 1/8 W J
R20	" -333AY	"	33 K " "
R21	" -183AY	"	18 K " "
R22	" -102AY	"	1 K " "
R23	" -332AY	"	3.3 K " "
R24	QVZ3506-102	VR	1 K
R25	QRD181J-101AY	CR	100 1/8 W J
R26	" -152AY	"	1.5 K " "
R27	" -102AY	"	1 K " "
R28	" -562AY	"	5.6 K " "
R29	" -153AY	"	15 K " "
R30	" -273AY	"	27 K " "
R31	" -151AY	"	150 " "
R32	" -681AY	"	680 " "
R33	QVZ3506-471	VR	470
R34	QRD181J-122AY	CR	1.2 K 1/8 W J
R35	" -391AY	"	390 " "
R36	–	–	
R37	–	–	
R38	QRD181J-561AY	CR	560 1/8 W J
R39	" -821AY	"	820 " "
R40	" -153AY	" (EG only)	15 K " "
R41	" -103AY	" (")	10 K " "
R42	" -333AY	"	33 K " "
R43	" -472AY	"	4.7 K " "
R44	" -472AY	"	4.7 K " "
R45	" -102AY	"	1 K " "
R46	QVZ3506-103	VR	10 K
R47	QRD181J-392AY	CR	3.9 K 1/8 W J
R48	" -821AY	"	820 " "
R49	" -472AY	"	4.7 K " "
R50	" -222AY	"	2.2 K " "
R51	" -222AY	"	2.2 K " "
R52	" -332AY	"	3.3 K " "
R53	" -102AY	"	1 K " "
R54	" -472AY	"	4.7 K " "
R55	" -102AY	"	1 K " "
R56	" -271AY	"	2.7 K " "
R57	" -102AY	"	1 K " "
R58	QRD141J-471	"	470 1/4 W J
R59	QRD181J-682AY	"	6.8 K 1/8 W J
R60	" -102AY	"	1 K " "
R61	–	–	
R62	–	–	
R63	–	–	
R64	–	–	
R65	–	–	
R66	QRD181J-103AY	CR	10 K 1/8 W J
R67	" -473AY	"	47 K " "
R68	" -562AY	" (EG only)	5.6 K " "
R69	" -222AY	"	2.2 K " "
R70	" -103AY	" (EG only)	10 K " "
R71	" -682AY	"	6.8 K " "
R72	" -561AY	"	560 " "
R73	" -332AY	"	3.3 K " "
R74	" -102AY	"	1 K " "
R75	QRD187J-332A	"	3.3 K " "
R76	QRD181J-222AY	"	2.2 K " "
R77	QVZ3506-103	VR	10 K
R78	QRD181J-104AY	CR	100 K 1/8 W J
R79	QRD187J-153A	"	15 K " "
R80	QRD181J-474AY	"	470 K " "

Symbol No.	Part No.	Part Name	Description
R81	QRD181J-564AY	CR	560 K 1/8 W J
R82	" -272AY	"	2.7 K " "
R83	" -152AY	"	1.5 K " "
R84	" -561AY	"	560 " "
R85	" -472AY	"	4.7 K " "
R86	" -472AY	"	4.7 K " "
R87	" -222AY	"	2.2 K " "
R88	" -123AY	"	12 K " "
R89	QVZ3506-332	VR	3.3 K
R90	QRD181J-183AY	CR	18 K 1/8 W J
R91	" -561AY	"	560 " "
R92	" -102AY	"	1 K " "
R93	QRD187J-103A	"	10 K " "
R94	QRD181J-223AY	"	22 K " "
R95	–	–	
R96	–	–	
R97	–	–	
R98	–	–	
R99	–	–	
R100	–	–	
R101	–	–	
R102	–	–	
R103	–	–	
R104	–	–	
R105	–	–	
R106	–	–	
R107	QRD181J-272AY	CR	2.7 K 1/8 W J
R108	QRD187J-474A	"	470 K " "
R109	QRD181J-104AY	"	100 K " "
R110	" -153AY	"	15 K " "
R111	QVZ3506-103	VR	10 K
R112	QRD181J-564AY	CR	560 K 1/8 W J
R113	" -682AY	"	6.8 K " "
R114	QRD187J-561A	"	560 " "
R115	QRD181J-331AY	"	330 " "
R116	" -561AY	"	560 " "
R117	" -102AY	"	1 K " "
R118	" -472A	"	4.7 K " "
R119	" -102AY	"	1 K " "
R120	" -103AY	"	10 K " "
R121	" -103AY	" (EG only)	10 K " "
C 1	QET51ER-476	E Cap	47 25 V
C 2	QEK51CM-476	"	47 16 V
C 3	" -476	"	47 "
C 4	QCF31HP-223	C Cap	0.022 50 V
C 5	QFN41HJ-333	MY Cap	0.033 "
C 6	" -333	"	0.033 "
C 7	" -223	"	0.022 "
C 8	QEK51CM-476	E Cap	47 16 V
C 9	QCS31HJ-820	C Cap	82 P 50 V
C10	QFN41HJ-333	MY Cap	0.033 "
C11	" -103	"	0.01 "
C12	QCF31HP-223	C Cap	0.022 "
C13	" -223	"	0.022 "
C14	QFN41HJ-333	MY Cap	0.033 "
C15	QCS31HJ-101	C Cap	100 P "
C16	QFN41HJ-103	MY Cap	0.01 "
C17	QCS31HJ-151	C Cap	150 P "
C18	QFN41HJ-152	MY Cap	0.0015 "
C19	QEK51HM-474	E Cap	0.47 "
C20	QCF31HP-223	C Cap	0.022 "

Symbol No.	Part No.	Part Name	Description
C21	QCS31HJ-471	C Cap	470 P 50 V
C22	QFN41HJ-103	MY Cap	0.01 "
C23	" -103	"	0.01 "
C24	" -103	"	0.01 "
C25	" -103	"	0.01 "
C26	QEK51CM-336	E Cap	33 16 V
C27	QCF31HP-223	C Cap	0.022 50 V
C28	QFN41HJ-103	MY Cap	0.01 "
C29	" -103	"	0.01 "
C30	" -103	"	0.01 "
C31	" -102	"	0.001 "
C32	QEK51CM-106	E Cap	10 16 V
C33	QCF31HP-223	C Cap	0.022 50 V
C34	QEK51CM-476	E Cap	47 16 V
C35	QEK51HM-105G	"	1 50 V
C36	QCS31HJ-101	C Cap	100 P "
C37	" -391	"	390 P "
C38	QFN41HJ-333	MY Cap	0.033 "
C39	QEK51HM-105G	E Cap	1 "
C40	QFN41HJ-683	MY Cap	0.068 "
C41	" -103	"	0.01 "
C42	" -183	"	0.018 "
C43	QEK51HM-105G	E Cap	1 "
C44	QCS31HJ-100	C Cap	10 P "
C45	" -5R0	"	5 P "
C46	QAT3001-015	Trimmer Cap	
C47	QEK51CM-336	E Cap	33 16 V
C48	QFN41HJ-103	MY Cap	0.01 50 V
C49	–	–	
C50	QCF31HP-223	C Cap (EG only)	0.022 50 V
C51	QEK51CM-476	E Cap	47 16 V
C52	QCF31HP-223	C Cap	0.022 50 V
C53	QCT05CH-330	"	33 P
C54	" -390	"	39 P
C55	QCF31HP-223	"	0.022 50 V
C56	QFN41HJ-102	MY Cap	0.001 "
C57	" -563	"	0.056 "
C58	QCS31HJ-561	C Cap	560 P "
C59	QEK51HM-105G	E Cap	1 "
C60	QFN41HJ-333	MY Cap	0.033 "
C61	" -102	"	0.001 "
C62	" -822	"	0.0082 "
C63	" -224	"	0.22 "
C64	QCT05CH-820	C Cap	82 P
C65	QCS31HJ-101	"	100 P 50 V
C66	" -820	"	82 P "
C67	QFN41HJ-102	MY Cap	0.001 "
C68	" -102	"	0.001 "
C69	" -103	"	0.01 "
C70	QCS31HJ-271	C Cap	270 P "
C71	QFN41HJ-103	MY Cap	0.01 "
C72	–	–	
C73	–	–	
C74	–	–	
C75	–	–	
C76	–	–	
C77	–	–	
C78	–	–	
C79	–	–	
C80	–	–	
C81	–	–	
C82	–	–	
C83	–	–	

Symbol No.	Part No.	Part Name	Description
C84	–	–	
C85	–	–	
C86	QEK51CM-476	E Cap	47 16 V
C87	QCF31HP-223	C Cap	0.022 50 V
C88	QCS31HJ-560	"	56 P "
C89	" -150	"	15 P "
C90	QFN41HJ-333	MY Cap	0.033 "
C91	" -223	"	0.022 "
C92	QCS31HJ-121	C Cap	120 P "
C93	QFN41HJ-102	MY Cap	0.001 "
C94	QCS31HJ-271	C Cap	270 P "
C95	" -561	"	560 P "
C96	QEK51CM-106	E Cap	10 16 V
C97	QCF31HP-102	C Cap (EG only)	0.001 50 V
L 1	PU48530-101K	Peaking Coil	
L 2	" -101K	"	
L 3	PU46003-8R2	Coil	
L 4	" -8R2	"	
L 5	PU47051-153	Choke Coil	
L 6	PU48530-101K	Peaking Coil	
L 7	" -101K	"	
L 8	PU47051-822	Coil	
L16	PU46003-3R9	Peaking Coil	
L17	PU48530-101K	"	
DL1	PU49960	2H Delay Line	
X'TAL 1	PU31449-2	Crystal	
X'TAL 2	PU46040	"	
X'TAL 3	PU31449-2	"	
BPF 1	PU49996	Filter	
BPF 2	"	"	
BPF 3	PU49465	"	
LPF 1	PU49464	"	
	PU49549	Power Switch	S1, S2
	A44594-001	Fuse Clip	
	PU46649	Test Pin	
	PU49213	Terminal	for BATT.
	PU49196	Terminal Holder	
	SBSE3008Z	Tap. Screw	
	PU49215-8	Cap. Housing	51 – 58
	" -8R	"	61 – 68
	" -3R	"	71 – 73
	" -2	"	81 – 82
	" -2Y	"	91 – 92
	" -7	"	101 – 107
	PU49217-20	Recept. Housing	
	PU49548	Heat Sink	
	PU41624-6	Insulator	
	PU45375	Mylar Spacer	
	LPSP3008ZS	Screw	
	DPSP3008ZS	"	

9.5.5 Y Amp. Ass'y .... PU49525C(EG)
PU49525D(EK)

Symbol No.	Part No.	Part Name	Description
IC 1	VC2019	IC	
IC 2	HA11701	″	
IC 3	HA11703-01	″	
X 1	2SC2647C	Transistor	
X 2	2SA786Q	″	
X 3	2SC2647C	″	
X 4	″	″	
X 5	″	″	
X 6	″	″	
X 7	″	″	
X 8	″	″	
X 9	″	″	
X10	″	″	
X11	″	″	
X12	″	″	
X13	″	″	
X14	″	″	
X15	2SD638R	″	
X16	2SC2647C	″	
X17	″	″	
X18	″	″	
X19	″	″	
X20	″	″	
X21	2SA881Q	″	
X22	2SC2647C	″	
X23	2SA881Q	″	
X24	″	″	
D 1	1SS133HV	Diode	
D 2	″	″	
D 3	″	″	
D 4	″	″	
D 5	V03C	″	
D 6	—	—	
D 7	—	—	
D 8	—	—	
D 9	U05B-F	Diode	
D10	1SS133HV	″	
R 1	QRD181J-103A	CR	10 K 1/8 W, J
R 2	″ -103A	″	10 K ″ ″
R 3	QRD141J-750	″	75 1/4 W, J
R 4	QRD181J-823A	″	82 K 1/8 W, J
R 5	″ -123A	″	12 K ″ ″
R 6	″ -682A	″	6.8 K ″ ″
R 7	″ -102A	″	1 K ″ ″
R 8	″ -104A	″	100 K ″ ″
R 9	″ -472A	″	4.7 K ″ ″
R10	″ -222A	″	2.2 K ″ ″
R11	″ -223A	″	22 K ″ ″
R12	QVZ3506-103	VR	10 K
R13	″ -472	″	4.7 K
R14	QRD181J-103A	CR	10 K 1/8 W, J
R15	″ -103A	″	10 K ″ ″
R16	″ -272A	″	2.7 K ″ ″
R17	QVZ3506-223	VR	22 K
R18	″ -223	″	22 K
R19	QRD181J-151A	CR	150 1/8 W, J
R20	″ -682A	″	6.8 K ″ ″
R21	QRD181J-392A	CR	3.9 K 1/8 W, J
R22	″ -103A	″	10 K ″ ″
R23	″ -822A	″	8.2 K ″ ″
R24	″ -392A	″	3.9 K ″ ″
R25	″ -222A	″	2.2 K ″ ″
R26	″ -102A	″	1 K ″ ″
R27	QVZ3506-222	VR	2.2 K
R28	QRD181J-221A	CR	220 1/8 W, J
R29	″ -391A	″	390 ″ ″
R30	″ -391A	″	390 ″ ″
R31	″ -271A	″	270 ″ ″
R32	″ -393A	″	39 K ″ ″
R33	″ -683A	″	68 K ″ ″
R34	″ -682A	″	6.8 K ″ ″
R35	″ -224A	″	220 K ″ ″
R36	″ -472A	″	4.7 K ″ ″
R37	″ -153A	″	15 K ″ ″
R38	QVZ3506-223	VR	22 K
R39	QRD181J-472A	CR	4.7 K 1/8 W, J
R40	″ -102A	″	1 K ″ ″
R41	″ -102A	″	1 K ″ ″
R42	″ -223A	″	22 K ″ ″
R43	″ -223A	″	22 K ″ ″
R44	″ -561A	″	560 ″ ″
R45	″ -222A	″	2.2 K ″ ″
R46	″ -222A	″	2.2 K ″ ″
R47	″ -391A	″	390 ″ ″
R48	″ -104A	″	100 K ″ ″
R49	″ -820A	″	82 ″ ″
R50	″ -182A	″	1.8 K ″ ″
R51	—	—	
R52	QRD181J-680A	CR	68 1/8 W, J
R53	″ -152A	″	1.5 K ″ ″
R54	″ -391A	″	390 ″ ″
R55	″ -561A	″	560 ″ ″
R56	″ -561A	″	560 ″ ″
R57	QVZ3506-102	VR	1 K
R58	QRD181J-561A	CR	560 1/8 W, J
R59	—	—	
R60	QRD181J-152A	CR	1.5 K 1/8 W, J
R61	″ -152A	″	1.5 K ″ ″
R62	″ -821A	″	820 ″ ″
R63	″ -152A	″	1.5 K ″ ″
R64	″ -122A	″	1.2 K ″ ″
R65	″ -222A	″	2.2 K ″ ″
R66	″ -392A	″	3.9 K ″ ″
R67	″ -222A	″	2.2 K ″ ″
R68	″ -102A	″	1 K ″ ″
R69	″ -184A	″	180 K ″ ″
R70	″ -122A	″	1.2 K ″ ″
R71	″ -563A	″	56 K ″ ″
R72	″ -223A	″	22 K ″ ″
R73	QVZ3506-223	VR	22 K
R74	QRD181J-184A	CR	180 K 1/8 W, J
R75	″ -561A	″	560 ″ ″
R76	″ -391A	″	390 ″ ″
R77	″ -153A	″	15 K ″ ″
R78	—	—	
R79	—	—	
R80	QRD181J-183A	CR	18 K 1/8 W, J
R81	QRD181J-474A	″	470 K ″ ″
R82	″ -331A	″	330 ″ ″
R83	″ -332A	″	3.3 K ″ ″

Symbol No.	Part No.	Part Name	Description
R84	QRD181J-223A	CR	22 K 1/8 W, J
R85	" -222A	"	2.2 K " "
R86	QRD121J-331	"	330 1/2 W, J
R87	QRD129J-470	OMR	47
R88	QRD181J-103A	CR	10 K 1/8 W, J
R89	" -103A	"	10 K " "
R90	" -103A	"	10 K " "
R91	" -103A	"	10 K " "
R92	QRD141J-750	CR	75 1/4 W, J
R93	QRD181J-271A	"	270 1/8 W, J
R94	QRD141J-750	"	75 1/4 W, J
R95	QRD181J-561A	"	560 1/8 W, J
R96	" -560A	" EG	56 " "
	" -470A	" EK	47 " "
R97	" -681A	"	680 " "
R98	" -122A	" EG	1.2 K " "
	" -102A	" EK	1 K " "
R99	" -561A	"	560 " "
R100	" -102A	"	1 K " "
R101	" -820A	" EG	82 " "
	" -101A	" EK	100 " "
R102	" -681A	"	680 " "
R103	" -104A	"	100 K " "
R104	" -102A	"	1 K " "
R105	" -473A	"	47 K " "
R106	" -223A	"	22 K " "
R107	" -104A	"	100 K " "
R108	" -102A	"	1 K " "
R109	" -473A	"	47 K " "
R110	" -104A	"	100 K " "
R111	QRD141J-750	"	75 1/4 W, J
R112	QRD181J-562A	"	5.6 K 1/8 W, J
R113	" -472A	"	4.7 K " "
R114	" -471A	"	470 " "
R115	" -222A	"	2.2 K " "
R116	–	–	
R117	QRD181J-471A	CR	470 1/8 W, J
C 1	QEN41CA-106	NP Cap	10 16 V
C 2	QEK41HM-474	E Cap	0.47 50 V
C 3	" -105	"	1 "
C 4	QEK41AM-226	"	22 10 V
C 5	QEN41AM-476	NP Cap	47 "
C 6	QEK41AM-476	E Cap	47 "
C 7	QEK40JM-476	"	47 6.3 V
C 8	QCS31HJ-121	C Cap	120 P 50 V
C 9	QCF31HP-223	"	0.022 "
C10	" -223	"	0.022 "
C11	" -223	"	0.022 "
C12	QCS31HJ-561	"	560 P "
C13	QFN41HJ-104	MY Cap	0.1 "
C14	QCF31HP-223	C Cap	0.022 "
C15	QET41CR-107	E Cap	100 16 V
C16	QFN41HJ-222	MY Cap	0.0022 50 V
C17	" -104	"	0.1 "
C18	QEK40JM-476	E Cap	47 6.3 V
C19	QEK41AM-476	"	47 10 V
C20	–	–	
C21	–	–	
C22	QEK41EM-475	E Cap	4.7 25 V
C23	QEK41CM-336	"	33 16 V
C24	QCS31HJ-101	C Cap	100 P 50 V

Symbol No.	Part No.	Part Name	Description
C25	QCS31HJ-101	C Cap	100 P 50 V
C26	" -820	"	82 P "
C27	QET41CR-107	E Cap	100 16 V
C28	QCF31HP-223	C Cap	0.022 50 V
C29	QFN41HJ-103	MY Cap	0.01 "
C30	QCS31HJ-151	C Cap	150 P "
C31	" -151	"	150 P "
C32	QFN41HJ-103	MY Cap	0.01 "
C33	" -103	"	0.01 "
C34	QEK41CM-336	E Cap	33 16 V
C35	–	–	
C36	QEK41CM-476	E Cap	47 16 V
C37	QCF31HP-223	C Cap	0.022 50 V
C38	QEK41CM-336	E Cap	33 16 V
C39	QCS31HJ-151	C Cap	150 P 50 V
C40	QFN41HJ-152	MY Cap	0.0015 "
C41	QCS31HJ-221	C Cap	220 P "
C42	" -331	"	330 P "
C43	" -680	"	68 P "
C44	QEK41AM-336	E Cap	33 10 V
C45	QEK41CM-476	"	47 16 V
C46	QCF31HP-223	C Cap	0.022 50 V
C47	QEK41AM-336	E Cap	33 10 V
C48	QCS31HJ-101	C Cap	100 P 50 V
C49	–	–	
C50	–	–	
C51	QEK41CM-106	E Cap	10 16 V
C52	QCS31HJ-181	C Cap	180 P 50 V
C53	QEK41CM-106M	E Cap	10 16 V
C54	QEK41EM-475M	"	4.7 25 V
C55	–	–	
C56	QCS11HJ-560	C Cap	56 P 50 V
C57	" -680	"	68 P "
C58	QCS31HJ-301	"	300 P "
C59	QFN41HJ-103	MY Cap	0.01 "
C60	" -102	"	0.001 "
C61	QET41CR-107	E Cap	100 16 V
C62	QCF31HP-223	C Cap	0.022 50 V
C63	QCS31HJ-101	"	100 P "
C64	QCS11HJ-180	"	18 P "
C65	" -180	"	18 P "
C66	QEK41CM-476	E Cap	47 16 V
C67	" -476	"	47 "
C68	QCF31HP-223	C Cap	0.022 50 V
C69	QEK41CM-106	E Cap	10 16 V
C70	QEK41AM-336	"	33 10 V
C71	QEK41CM-476	"	47 16 V
C72	QCF31HP-223	C Cap	0.022 50 V
C73	" -223	"	0.022 "
C74	QET41AR-477	E Cap	470 10 V
C75	QEK40HM-476	"	47 50 V
C76	" -476	"	47 "
C77	" -560	"	56 "
C78	QEK40JM-107	"	100 6.3 V
C79	QEK41CM-476	"	47 16 V
C80	QEK41EM-335	"	3.3 25 V
C81	QCF31HP-223	C Cap	0.022 50 V
C82	" -223	"	0.022 "
C83	QET40JR-227	E Cap	220 6.3 V
C84	–	–	
C85	QFN41HJ-102	MY Cap	0.001 50 V
C86	QCS11HJ-100	C Cap	10 P "
C87	" -150	"	15 P "

Symbol No.	Part No.	Part Name	Description
C88	QCS11HJ-180	C Cap	18 P 50 V
C89	" -820	"	82 P "
C90	QCS11HP-223	"	0.022 "
C91	QCS11HJ-150	"	15 P "
L 1	PU30284-19RN	Choke Coil	
L 2	" -22RN	"	
L 3	PU48530-121K	Peaking Coil	
L 4	" -680K	"	
L 5	" -101K	"	
L 6	" -101K	"	
L 7	" -101K	"	
L 8	–	–	
L 9	PU48530-3R3K	Peaking Coil	
L10	" -180K	"	
L11	" -180K	"	
L12	" -101K	"	
L13	" -101K	"	
L14	" -331K	"	
L15	" -101K	"	
L16	" -680K	"	
L17	–	–	
L18	PU48530-101K	Peaking Coil	
L19	" -6R8K	"	
L20	" -1R5K	"	
L21	" -680K	"	
LPF 1	PU49462	Low-Pass Filter	
LPF 2	"	"	
EQ 1	PU48519-2	Equalizer	
EQ 2	" -2	"	
EQ 3	PU31933-3	"	EG only
	PU49641	RF Converter	EG
	PU49642	"	EK
	PU49279	Connector	
	PU49059	RF Converter Holder	
	PU50416	Earth Plate	
	DPSP2606Z	Screw	
	PU49774A	Connector Board Ass'y (2)	
	SBSE3008Z	Tapping Screw	
	PU49218-15	Cap. Housing	21-35
	" -20	"	1-20
	PU46649	Test Point	
	PU43192-4	Binder	

9.5.6 Servo Ass'y PU50408C

Symbol No.	Part No.	Part Name	Description
IC 1	HA11711-01	IC	–
IC 2	TC4066BP	"	or UPD4066C, or HD14066B
IC 3	VC1029	"	–
IC 4	UPC324C	"	–
IC 5	VC1029	"	–
IC 6	DN850	"	–
IC 7	TC4028BP	"	or UPD4028C, or HD14028B
IC 8	UPC358C	"	–
IC 9	BA222V	"	–
IC10	M51204L	"	–
IC11	BA841A	"	or BA841
IC12	BA222V	"	–
IC13	VC1029	"	–
IC14	TC4066BP	"	or UPC4066C, or HD14066B
IC15	AN6551	"	–
X 1	2SC2063Q	Transistor	or 2SC2021Q, R
X 2	"	"	"
X 3	"	"	"
X 4	"	"	or 2SC2021Q
X 5	"	"	or 2SC2021Q, R
X 6	"	"	"
X 7	–	–	–
X 8	2SA881Q	"	or 2SB822Q, R
X 9	2SA786Q	"	or 2SA937Q
X10	2SA881Q	"	or 2SB822Q, R
X11	2SC2063Q	"	or 2SC2021Q, R
X12	2SA786Q	"	or 2SA937Q
X13	2SC2021Q	"	or 2SC2021Q, R
X14	"	"	or 2SC2021Q
X15	"	"	or 2SC2021Q, R
X16	"	"	"
X17	"	"	"
X18	"	"	"
X19	"	"	"
X20	"	"	"
X21	"	"	"
X22	2SA786Q	"	or 2SA937Q
X23	"	"	"
X24	2SC2063Q	"	or 2SC2021Q, R
X25	"	"	"
X26	"	"	"
X27	2SD882Q, P	"	
X28	"	"	
X29	"	"	
X30	"	"	
X31	2SC2063Q	"	or 2SC2021Q
X32	2SA786Q	"	or 2SA937Q
X33	"	"	"
X34	2SC2063Q	"	or 2SC2021Q, R
X35	"	"	"
X36	"	"	or 2SC2021Q
X37	2SA786Q	"	or 2SA937Q
X38	"	"	"
X39	"	"	"
X40	2SC2063Q	"	or 2SC2021Q, R
X41	"	"	"
X42	"	"	"
X43	"	"	"

Symbol No.	Part No.	Part Name	Description
X44	2SC2063Q	Translstor	or 2SC2021Q, R
X45	2SA786Q	"	or 2SA937Q
X46	2SC2063Q	"	or 2SC2021Q, R
X47	2SC1881K	"	
X48	2SC1983R	"	
X49	2SB772Q, P	"	
X50	2SA786Q	"	or 2SA937Q
X51	2SC2063Q	"	or 2SC2021Q, R
X52	"	"	"
D 1	1SS133HV	Diode	
D 2	RD3.9EB	Zener Diode	
D 3	1SS133HV	Diode	
D 4	"	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
D 8	"	"	
D 9	"	"	
D10	–	–	
D11	–	–	
D12	1SS133HV	Transistor	
D13	"	"	
D14	"	"	
D15	"	"	
D16	"	"	
D17	"	"	
D18	RD9.1EB3	Zener Diode	
D19	1SS133HV	Diode	
D20	"	"	
D21	"	"	
D22	"	"	
D23	"	"	
D24	"	"	
D25	V03C	"	
D26	"	"	
D27	1SS133HV	"	
D28	"	"	
D29	"	"	
D30	"	"	
D31	"	"	
D32	"	"	
D33	"	"	
D34	"	"	
D35	"	"	
D36	"	"	
D37	"	"	
D38	"	"	
D39	"	"	
D40	"	"	
D41	"	"	
D42	–	–	
D43	1SS133HV	Diode	
D44	"	"	
D45	"	"	
D46	"	"	
D47	"	"	
D48	MA26T-A	"	
D49	1SS133HV	"	
D50	"	"	
D51	"	"	
D52	"	"	
D53	"	"	
D54	"	"	
R 1	PU49211	VR	250 K
R 2	QVZ3506-104	"	100 K
R 3	QRD181J-473A	CR	47 K 1/8 W, J
R 4	QVZ3507-223	VR	22 K
R 5	QRD181J-273A	CR	27 K 1/8 W, J

Symbol No.	Part No.	Part Name	Description
R 6	QRD181J-104A	CR	100 K 1/8 W, J
R 7	" -104A	"	100 K " "
R 8	" -103A	"	10 K " "
R 9	" -474A	"	470 K " "
R10	" -104A	"	100 K " "
R11	" -563A	"	56 K " "
R12	" -104A	"	100 K " "
R13	" -103A	"	10 K " "
R14	" -103A	"	10 K " "
R15	QVZ3507-473	VR	10 K
R16	" -473	"	47 K
R17	QRD181J-103A	CR	10 K 1/8 W, J
R18	" -104A	"	100 K " "
R19	" -104A	"	100 K " "
R20	" -104A	"	100 K " "
R21	" -104A	"	100 K " "
R22	" -104A	"	100 K " "
R23	" -563A	"	56 K " "
R24	" -222A	"	2.2 K " "
R25	" -224A	"	220 K " "
R26	QVZ3506-104	VR	100 K
R27	QRD181J-154A	CR	150 K 1/8 W, J
R28	" -154A	"	150 K " "
R29	QVZ3506-104	VR	100 K
R30	QRD181J-224A	CR	220 K 1/8 W, J
R31	" -224A	"	220 K " "
R32	" -274A	"	270 K " "
R33	QVZ3506-474	VR	470 K " "
R34	QRD181J-224A	CR	220 K " "
R35	" -104A	"	100 K " "
R36	" -104A	"	100 K " "
R37	" -474A	"	470 K " "
R38	" -683A	"	68 K " "
R39	" -474A	"	470 K " "
R40	" -105A	"	1 M " "
R41	" -103A	"	10 K " "
R42	" -104A	"	100 K " "
R43	" -104A	"	100 K " "
R44	" -563A	"	56 K " "
R45	" -273A	"	27 K " "
R46	" -124A	"	120 K " "
R47	QVZ3507-223	VR	22 K
R48	QRD181J-563A	CR	56 K 1/8 W, J
R49	" -184A	"	180 K " "
R50	" -104A	"	100 K " "
R51	" -224A	"	220 K " "
R52	" -104A	"	100 K " "
R53	" -103A	"	10 K " "
R54	" -472A	"	4.7 K " "
R55	" -564A	"	560 K " "
R56	" -105A	"	1 M " "
R57	" -683A	"	68 K " "
R58	" -683A	"	68 K " "
R59	" -684A	"	680 K " "
R60	" -333A	"	33 K " "
R61	" -684A	"	680 K " "
R62	" -273A	"	27 K " "
R63	" -104A	"	100 K " "
R64	" -153A	"	15 K " "
R65	" -333A	"	33 K " "
R66	" -104A	"	100 K " "
R67	" -393A	"	39 K " "
R68	–	–	

Symbol No.	Part No.	Part Name	Description
R69	–	–	
R70	–	–	
R71	–	–	
R72	–	–	
R73	QRD181J-103A	CR	10 K 1/8 W, J
R74	″ -103A	″	10 K ″ ″
R75	″ -472A	″	4.7 K ″ ″
R76	″ -223A	″	22 K ″ ″
R77	″ -563A	″	56 K ″ ″
R78	″ -103A	″	10 K ″ ″
R79	″ -472A	″	4.7 K ″ ″
R80	″ -103A	″	10 K ″ ″
R81	″ -103A	″	10 K ″ ″
R82	QVZ3506-473	″	47 K
R83	QRD181J-273A	″	27 K 1/8 W, J
R84	″ -474A	″	470 K ″ ″
R85	″ -223A	″	22 K ″ ″
R86	″ -223A	″	22 K ″ ″
R87	″ -471A	″	470 ″ ″
R88	″ -105A	″	1 M ″ ″
R89	″ -102A	″	1 K ″ ″
R90	″ -104A	″	100 K ″ ″
R91	″ -105A	″	1 M ″ ″
R92	″ -104A	″	100 K ″ ″
R93	″ -393A	″	39 K ″ ″
R94	″ -104A	″	100 K ″ ″
R95	″ -153A	″	15 K ″ ″
R96	QVZ3506-104	VR	100 K
R97	QRD181J-153A	CR	15 K 1/8 W, J
R98	QVZ3506-104	VR	100 K
R99	QRD181J-103A	CR	10 K 1/8,W, J
R100	″ -104A	″	100 K ″ ″
R101	″ -104A	″	100 K ″ ″
R102	″ -104A	″	100 K ″ ″
R103	″ -563A	″	56 K ″ ″
R104	″ -682A	″	6.8 K ″ ″
R105	″ -682A	″	6.8 K ″ ″
R106	″ -102A	″	1 K ″ ″
R107	″ -153A	″	15 K ″ ″
R108	″ -153A	″	15 K ″ ″
R109	″ -153A	″	15 K ″ ″
R110	″ -153A	″	15 K ″ ″
R111	″ -124A	″	120 K ″ ″
R112	″ -124A	″	120 K ″ ″
R113	″ -124A	″	120 K ″ ″
R114	″ -124A	″	120 K ″ ″
R115	″ -103A	″	10 K ″ ″
R116	″ -103A	″	10 K ″ ″
R117	″ -683A	″	68 K ″ ″
R118	″ -104A	″	100 K ″ ″
R119	″ -563A	″	56 K ″ ″
R120	″ -154A	″	150 K ″ ″
R121	″ -154A	″	150 K ″ ″
R122	″ -103A	″	10 K ″ ″
R123	″ -154A	″	150 K ″ ″
R124	″ -223A	″	22 K ″ ″
R125	″ -154A	″	150 K ″ ″
R126	″ -223A	″	22 K ″ ″
R127	″ -223A	″	22 K ″ ″
R128	″ -154A	″	150 K ″ ″
R129	–	–	
R130	–	–	
R131	–	–	

Symbol No.	Part No.	Part Name	Description
R132	–	–	
R133	–	–	
R134	–	–	
R135	QVZ3506-473	VR	47 K
R136	″ -473	″	47 K
R137	″ -473	″	47 K
R138	″ -473	″	47 K
R139	QRD181J-224A	CR	220 K 1/8 W,J
R140	″ -104A	″	100 K ″ ″
R141	″ -563A	″	56 K ″ ″
R142	″ -563A	″	56 K ″ ″
R143	″ -563A	″	56 K ″ ″
R144	″ -563A	″	56 K ″ ″
R145	″ -104A	″	100 K ″ ″
R146	″ -154A	″	150 K ″ ″
R147	″ -104A	″	100 K ″ ″
R148	″ -104A	″	100 K ″ ″
R149	″ -104A	″	100 K ″ ″
R150	″ -104	″	100 K ″ ″
R151	″ -224A	″	220 K ″ ″
R152	″ -123A	″	12 K ″ ″
R153	″ -184A	″	180 K ″ ″
R154	″ -104A	″	100 K ″ ″
R155	″ -563A	″	56 K ″ ″
R156	″ -394A	″	390 K ″ ″
R157	″ -103A	″	10 K ″ ″
R158	″ -223A	″	22 K ″ ″
R159	″ -562A	″	5.6 K ″ ″
R160	″ -104A	″	100 K ″ ″
R161	″ -563A	″	56 K ″ ″
R162	″ -563A	″	56 K ″ ″
R163	″ -563A	″	56 K ″ ″
R164	″ -563A	″	56 K ″ ″
R165	″ -562A	″	5.6 K ″ ″
R166	″ -152A	″	1.5 K ″ ″
R167	″ -152A	″	1.5 K ″ ″
R168	″ -393A	″	39 K ″ ″
R169	″ -103A	″	10 K ″ ″
R170	″ -103A	″	10 K ″ ″
R171	″ -103A	″	10 K ″ ″
R172	″ -103A	″	10 K ″ ″
R173	″ -393A	″	39 K ″ ″
R174	″ -102A	″	1 K ″ ″
R175	″ -563A	″	56 K ″ ″
R176	″ -104A	″	100 K ″ ″
R177	″ -563A	″	56 K ″ ″
R178	″ -104A	″	100 K ″ ″
R179	″ -103A	″	10 K ″ ″
R180	″ -563A	″	56 K ″ ″
R181	″ -104A	″	100 K ″ ″
R182	″ -563A	″	56 K ″ ″
R183	″ -103A	″	10 K ″ ″
R184	″ -563A	″	56 K ″ ″
R185	″ -563A	″	56 K ″ ″
R186	″ -103A	″	10 K ″ ″
R187	″ -103A	″	10 K ″ ″
R188	″ -274A	″	270 K ″ ″
R189	QVZ3507-474	VR	470 K
R190	QRD181J-102A	CR	1 K 1/8 W, J
R191	PU49211	VR	250 K
R192	QRD181J-124A	CR	120 K 1/8 W, J
R193	″ -563A	″	56 K ″ ″
R194	″ -103A	″	10 K ″ ″

Symbol No.	Part No.	Part Name	Description
R195	QRD181J-102A	CR	1 K 1/8 W, J
R196	QVZ3507-474	VR	470 K
R197	QRD181J-223A	CR	22 K 1/8 W, J
R198	PU49212	VR	50 K
R199	QRD181J-222A	CR	2.2 K 1/8 W, J
R200	″ -684A	″	680 K ″ ″
R201	″ -102A	″	1 K ″ ″
R202	″ -104A	″	100 K ″ ″
R203	QVZ3507-474	VR	470 K
R204	QRD18J-563A	CR	56 K 1/8 W,J
R205	″ -223A	″	22 K ″ ″
R206	″ -105A	″	1 M ″ ″
R207	″ -273A	″	27 K ″ ″
R208	″ -333A	″	33 K ″ ″
R209	″ -394A	″	390 K ″ ″
R210	QVZ3507-224	VR	220 K
R211	QRD181J-564A	CR	560 K 1/8 W, J
R212	″ -123A	″	12 K ″ ″
R213	″ -105A	″	1 M ″ ″
R214	″ -102A	″	1 K ″ ″
R215	″ -101A	″	100 ″ ″
R216	″ -333A	″	33 K ″ ″
R217	″ -104A	″	100 K ″ ″
R218	″ -154A	″	150 K ″ ″
R219	″ -474A	″	470 K ″ ″
R220	″ -104A	″	100 K ″ ″
R221	″ -563A	″	56 K ″ ″
R222	″ -224A	″	220 K ″ ″
R223	″ -105A	″	1 M ″ ″
R224	″ -393A	″	39 K ″ ″
R225	″ -224A	″	220 K ″ ″
R226	″ -224A	″	220 K ″ ″
R227	″ -563A	″	56 K ″ ″
R228	—	—	
R229	QRD181J-473A	CR	47 K 1/8 W, J
R230	″ -103A	″	10 K ″ ″
R231	″ -563A	″	56 K ″ ″
R232	″ -103A	″	10 K ″ ″
R233	″ -563A	″	56 K ″ ″
R234	″ -103A	″	10 K ″ ″
R235	″ -474A	″	470 K ″ ″
R236	″ -392A	″	3.9 K ″ ″
R237	″ -105A	″	1 M ″ ″
R238	″ -102A	″	1 K ″ ″
R239	″ -563A	″	56 K ″ ″
R240	″ -563A	″	56 K ″ ″
R241	″ -103A	″	10 K ″ ″
R242	″ -222A	″	2.2 K ″ ″
R243	″ -223A	″	22 K ″ ″
R244	—	—	
R245	QRD181J-472A	CR	4.7 K 1/8 W, J
R246	″ -102A	″	1 K ″ ″
R247	″ -562A	″	5.6 K ″ ″
R248	″ -184A	″	180 K ″ ″
R249	″ -104A	″	100 K ″ ″
R250	″ -183A	″	18 K ″ ″
R251	″ -472A	″	4.7 K ″ ″
R252	″ -102A	″	1 K ″ ″
R253	″ -393A	″	39 K ″ ″
R254	″ -471A	″	470 ″ ″
R255	″ -822A	″	8.2 K ″ ″
R256	″ -223A	″	22 K ″ ″
R257	″ -103A	″	10 K ″ ″

Symbol No.	Part No.	Part Name	Description
R258	QRD181J-103A	CR	10 K 1/8 W, J
R259	″ -102A	″	1 K ″ ″
R260	″ -183A	″	18 K ″ ″
R261	″ -822A	″	8.2 K ″ ″
R262	″ -104A	″	100 K ″ ″
R263	″ -223A	″	22 K ″ ″
C 1	—	—	
C 2	QET41ER-107	E Cap	100 25 V
C 3	″ -107	″	100 ″
C 4	QFN41HJ-103	MY Cap	0.01 50 V
C 5	QEK41HM-105	E Cap	1 ″
C 6	″ -105	″	1 ″
C 7	QFM71HJ-104	MY Cap	0.1 ″
C 8	QFM41HJ-333	″	0.033 ″
C 9	QCS11HJ-331	C Cap	330 P ″
C10	QFN41HJ-472	MY Cap	0.0047 ″
C11	QFM71HJ-104	″	0.1 ″
C12	QEK41CM-476	E Cap	47 16 V
C13	″ -106	″	10 ″
C14	QFN41HJ-683	MY Cap	0.068 50 V
C15	″ -683	″	0.068 ″
C16	QEN41CM-475	NP Cap	4.7 16 V
C17	QFM71HJ-473	MY Cap	0.047 50 V
C18	QFN41HJ-333	″	0.033 ″
C19	QCS11HJ-331	C Cap	330 P ″
C20	QFN41HJ-472	MY Cap	0.0047 ″
C21	QCS11HJ-680	C Cap	68 P ″
C22	QFN41HJ-473	MY Cap	0.047 ″
C23	QEK41CM-476	E Cap	47 16 V
C24	QEE41CM-475	T Cap	4.7 ″
C25	″ -475	″	4.7 ″
C26	QEK41HM-105	E Cap	1 50 V
C27	QEN41HJ-222	MY Cap	0.0022 ″
C28	″ -103	″	0.01 ″
C29	QEK41CM-226	E Cap	22 16 V
C30	QFN41HJ-103	MY Cap	0.01 50 V
C31	QEK41HM-105	E Cap	1 ″
C32	QFN41HJ-102	MY Cap	0.001 ″
C33	QFM71HJ-682M	″	0.0068 ″
C34	QEK41CM-106	E Cap	10 16 V
C35	QFN41HJ-103	MY Cap	0.01 50 V
C36	″ -123	″	0.012 ″
C37	″ -103	″	0.01 ″
C38	QEK41HM-105	E Cap	1 ″
C39	QEK41CM-476	″	47 16 V
C40	QFN41HJ-122	MY Cap	0.0012 50 V
C41	″ -122	″	0.0012 ″
C42	—	—	
C43	QEK41HM-105	E Cap	1 50 V
C44	QFN41HJ-102	MY Cap	0.001 ″
C45	QEK41CM-106	E Cap	10 16 V
C46	QFN41HJ-102	MY Cap	0.001 50 V
C47	″ -103	″	0.01 ″
C48	QEK41CM-106	E Cap	10 16 V
C49	QFN41HJ-103	MY Cap	0.01 50 V
C50	QEK41CM-226	E Cap	22 16 V
C51	″ -476	″	47 ″
C52	QCS11HJ-470	C Cap	47 P 50 V
C53	QEK41CM-106	E Cap	10 16 V
C54	QFN41HJ-103	MY Cap	0.01 50 V
C55	QEK41CM-106	E Cap	10 16 V
C56	″ -476	″	47 ″
C57	QFN41HJ-103	MY Cap	0.01 50 V
C58	″ -334	″	0.33 ″
C59	″ -103	″	0.01 ″

Symbol No.	Part No.	Part Name	Description
C60	QFN41HJ-224	MY Cap	0.22 50 V
C61	" -103	"	0.01 "
C62	" -334	"	0.33 "
C63	QEK41CM-476	E Cap	47 16 V
C64	QEN41CM-106	NP Cap	10 "
C65	QEK41EM-335	E Cap	3.3 25 V
C66	QEK41CM-476	E Cap	47 16 V
C67	" -476	"	47 "
C68	QCS11HJ-391	C Cap	390 P 50 V
C69	QET41ER-227	E Cap	220 25 V
C70	" -107	"	100 "
C71	QFN41HJ-332	MY Cap	0.0033 50 V
C72	" -103	"	0.01 "
C73	" -223	"	0.022 "
C74	QEK41CM-476	E Cap	47 16 V
C75	QFN41HJ-102	MY Cap	0.001 50 V
C76	" -473	"	0.047 "
C77	" -104	"	0.1 "
C78	" -333	"	0.033 "
C79	" -682	"	0.0068 "
C80	" -104	"	0.1 "
C81	" -152	"	0.0015 "
C82	" -153	"	0.015 "
C83	QEK41EM-335	E Cap	3.3 25 V
C84	" -335M	"	3.3 "
C85	QEK41CM-476	"	47 16 V
C86	QEK41HM-474	"	0.47 50 V
C87	QFN41HJ-683	MY Cap	0.068 "
C88	" -102	"	0.001 "
C89	QFM71HJ-223M	"	0.022 "
C90	QEK41CM-106	E Cap	10 16 V
C91	QFN41HJ-103	MY Cap	0.01 50 V
C92	" -273	"	0.027 "
C93	QEK41CM-226	E Cap	22 16 V
C94	QEN41CM-475	NP Cap	4.7 16 V
C95	QCS11HJ-181	C Cap	180 P 50 V
C96	QEK41HM-105	E Cap	1 50 V
C97	" -105	"	1 "
C98	QEK41CM-476	"	47 16 V
C99	" -106	"	10 "
C100	" -106	"	10 "
C101	QEE41CM-226	T Cap	22 "
C102	" -226	"	22 "
C103	QEN41CM-106	NP Cap	10 "
C104	QFN41HJ-102	MY Cap	0.001 50 V
C105	QEK41CM-476	E Cap	47 16 V
C106	QEK41EM-106	E Cap	10 25 V
C107	" -106	"	10 "
C108	QEK41HM-105	"	1 50 V
C109	QEK41CM-476	"	47 16 V
C110	QEK41EM-106	"	10 25 V
C111	QEK41CM-476	"	47 16 V
C112	" -476	"	47 16 V
C113	QEK41HM-105	"	1 50 V
C114	QFN41HJ-103	MY Cap	0.01 "
C115	" -103	"	0.01 "
C116	QFN41HJ-223	"	0.022 "
C117	QEK41HM-105	E Cap	1 "
C118	QFN41HJ-223	MY Cap	0.022 "
L 1	PU43677	Coil	
L 2	PU50277	Inductor	
LPF1	PU47681	Low-pass Filter	
X'L1	PU47701	Crystal	

Symbol No.	Part No.	Part Name	Description
⚠	A44594-001	Fuse Holder	
CN 1	PU49218-20	Cap Housing	
CN 2	" -20	"	
	PU48855	Heat Sink	for X47 and X49
	PU41624-6	Insulation Washer	
	PU45375	Transistor Spacer	
	LPSP3008ZS	Screw	
	PU46649	Test Point	

9.5.7 Drum MDA Ass'y. PU49986D

Symbol No.	Part No.	Part Name	Description
X 1	2SC2785J, H, F	Transistor	
X 2	2SA1175J, H, F, E	"	
X 3	2SA1175JHFE	"	
X 4	"	"	
X 5	2SC2785H	"	X5 – X12
X 6	"	"	or 2SC2785J, F
X 7	"	"	
X 8	"	"	✻
X 9	"	"	
X 10	"	"	
X 11	"	"	
X 12	"	"	
X 13	2SC2785J, H, F, E	"	
X 14	2SB772R	"	or 2SB743R
X 15	"	"	"
X 16	"	"	"
X 17	"	"	"
X 18	2SD882E	"	X18 – X21
X 19	"	"	or 2SD822P,
X 20	"	"	2SD741P, E, F
X 21	"	"	✻
X 22	2SA1175H	"	X22 – X25
X 23	"	"	or 2SA1175J, F
X 24	"	"	✻
X 25	"	"	
X 26	2SA1175J, H, F, E	"	
X 27	2SC2259F, G	"	or 2SC1583FG
R 1	QRS188J 562T	CH R	5.6 K 1/8 W,J
R 2	" -562T	"	" "
R 3	" -680T	"	68 "
R 4	" -680T	"	" "
R 5	" -392T	"	3.9 K "
R 6	" -392T	"	" "
R 7	" -393T	"	39 K "
R 8	" -393T	"	" "
R 9	" -681T	"	680 "
R 10	" -681T	"	" "
R 11	" -682T	"	6.8 K "
R 12	" -682T	"	" "
R 13	" -124T	CH R	120 K "
R 14	" -681T	"	680 "
R 15	" -474T	"	470 K "
R 16	" -474T	"	" "
R 17	" -474T	"	" "
R 18	" -474T	"	" "
R 19	" -271T	"	270 "
R 20	" -271T	"	" "
R 21	" -271T	"	" "
R 22	" -271T	"	" "
R 23	" -331T	"	330 "
R 24	" -331T	"	" "
R 25	" -472T	"	4.7 K "
R 26	" -472T	"	" "
R 27	" -472T	"	" "
R 28	" -472T	"	" "
R 29	" -331T	"	330 "
R 30	" -331T	"	" "
R 31	" -561T	"	560 "
R 32	" -270T	"	27 "
R 33	" -270T	"	" "
R 34	QRG016J-R68	O M F R	0.68 1 W
R 35	QRS188J-101T	CH R	100 1/8 W,J
R 36	" -101T	"	" "
R 37	" -223T	"	22 K "
R 38	" -222T	"	2.2 K "
J 1–12	QRS188J-0R0T	CH R	0 "
C 1	QCY81HK-223K	CH Cap	0.022 50V
C 2	" -223K	"	" "
C 3	QEN41EM-475	NP Cap	4.7 25V
C 4	" -475	"	" "
	PU50434	Transistor Heat Sink	
	PU45375	Transistor Spacer	
	LPSP2606ZS	Screw	
	LPSP3008ZS	"	
	PU49215-114	Cap Housing	1 –14
	" -107	"	21 – 27

9.5.8 Terminal Board Ass'y PU49868A

Symbol No.	Part No.	Part Name	Description
C 1	QEL71CR-478M	E Cap	4700 16 V
	PU49215-2	Cap Housing	

✻ **The same type of board uses the same parts of the same rank.**

9.5.9 SECAM Detector Board Ass'y . . . PU50031A (EG only)

Symbol No.	Part No.	Part Name	Description
IC 5	BA401	Integrated Circuit	
IC 6	21VT02	"	
X13	2SC1652Q	Transistor	
R95	QVZ3506-102	VR	1 K
R96	QRD187J-102A	CR	1 K 1/8 W, J
R97	" -332A	"	3.3 K " "
R98	" -272A	"	2.7 K " "
R99	" -391A	"	390 " "
R100	ERT-D2FGL-601S	Thermistor	
R101	QRD187J-561A	CR	560 1/8 W, J
R102	–	–	
R103	–	–	
R104	–	–	
R105	QRD187J-102A	CR	1 K 1/8 W, J
R106	" -222A	"	2.2 K " "
C72	QFN41HJ-103	MY Cap	0.01 50 V
C73	QCF31HP-223	C Cap	0.022 "
C74	QFN41HJ-103	MY Cap	0.01 "
C75	QEK51CM-336	E Cap	33 16 V
C76	QCF31HP-222	C Cap	0.0022 50 V
C77	QCT05LH-331	"	330 P
C78	QCS31HJ-221	"	220 P 50 V
C79	QFN41HJ-223	MY Cap	0.022 "
C80	QEK51HM-105G	E Cap	1 "
C81	–	–	
C82	QFN41HJ-104	MY Cap	0.1 50 V
C83	QEK51HR-105	E Cap	1 "
C84	QEK51CR-476	"	47 16 V
C85	QCF31HP-223	C Cap	0.022 50 V
L 9	PU48530-101K	Peaking Coil	
L10	PU46398	Coil	
L11	PU48530-150K	Peaking Coil	
L12	PU47051-183	Coil	
L13	" -102	"	
L14	PU49057	1/2 fH Trap	
L15	PU46021-101	Choke Coil	
	PU46649	Test Pin	
	PU43351-105	Cap. Housing	

No. 8187 (2/3)

JVC Service Manual

E

VICTOR COMPANY OF JAPAN, LIMITED

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SECTION 1
GENERAL DESCRIPTION

This manual provides service information for the JVC TU-22E Tuner/Adapter. The manual describes adjustment of electrical operation. Service procedures given herein cover only field maintenance services. Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at the factory.

Due to design modifications, the servicing procedures and data given in this manual are subject to prossible change without prior notice.

For convenience, the text of the Instructions is reproduced on the following pages. Numbering of the pages also corresponds to the Instructions. However, the Instructions used by the customers are in English, French and German versions. The following is a reprint of only the English version.

TU-22EG

Thank you for purchasing the JVC TU-22EG Tuner/Adapter. This unit enables off-air VHF-UHF TV programmes to be recorded with the JVC HR-2200EG portable video cassette recorder. It also permits other functions such as automatic unattended recording of TV programmes with its built-in timer and permits quick-charging of the NB-P1 Ni-Cd battery pack installed in the HR-2200EG.

To obtain the best performance and greatest utilization from your TU-22EG, read this instruction booklet completely and carefully.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

CAUTION

Dangerous voltage inside. Refer internal servicing to qualified service personnel. To prevent electric shock or fire hazard, remove the power cord from the AC outlet prior to connecting or disconnecting any signal lead or aerial, prior to replacing the fuse, and prior to altering the voltage setting.

POWER SYSTEM

Connection to the mains supply

The operating voltage of this set is preset to 220 V∿ at the factory.

Before connecting to mains, check that the voltage selector on the rear panel is set to the same voltage as your local mains supply.

Adapting to local power line

This set operates on either 110, 127, 220 or 240 V∿. If the preset voltage is different from the power line voltage in your area, reset the voltage selector by inserting a screwdriver into the slot of the voltage selector and turning it until the correct voltage is displayed.

IMPORTANT: It is permissible to record television programmes only in the event that third party copyrights and other rights are not violated.

MAINS POWER SWITCH

The mains switch is located on the rear connector panel. Setting this switch to OFF removes all applied power from the set including the timer clock. Switching on and off the tuner section is performed with the front panel sub-power ON/OFF buttons.

Note:

The rating plate is on the rear of the unit.

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Features 2
Precautions 2
Controls and connectors 3
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FEATURES

- The built-in timer enables switching on and off at desired preset times during any one of 10 days in advance, including the day of setting.
- 12-Channel electronic TV tuner having pushbutton (feather-light touch) channel selectors.
- Channel lock mechanism for preventing the selected channel from being changed by accidentally touching the channel selectors.
- Serves as an AC power adapter for the HR-2200EG portable recorder.
- Quick-charging function for the NB-P1 Ni-Cd battery pack installed in the HR-2200EG.

PRECAUTIONS

- Prevent inflammables, water and metallic objects from entering the TU-22EG unit.
- Do not remodel or disassemble the unit. To do so is dangerous and damage may result.
- Do not damage the power cord as this could cause electrical shocks.
- Remove the AC power cord from the AC outlet when you are not using the unit for a long period.

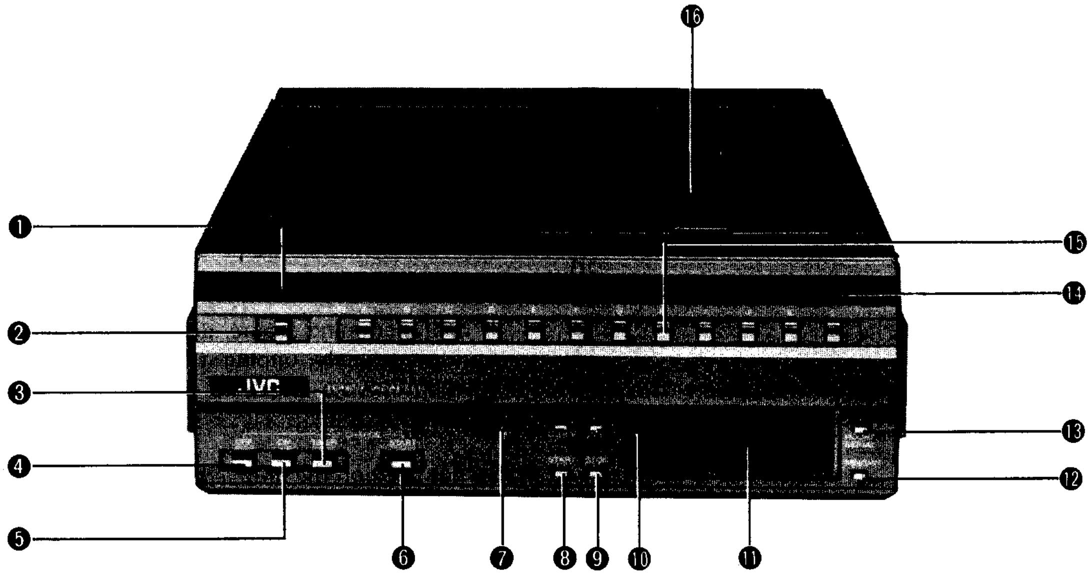
If malfunctioning occurs, discontinue using the unit immediately, unplug it from the AC outlet and consult your local JVC dealer.

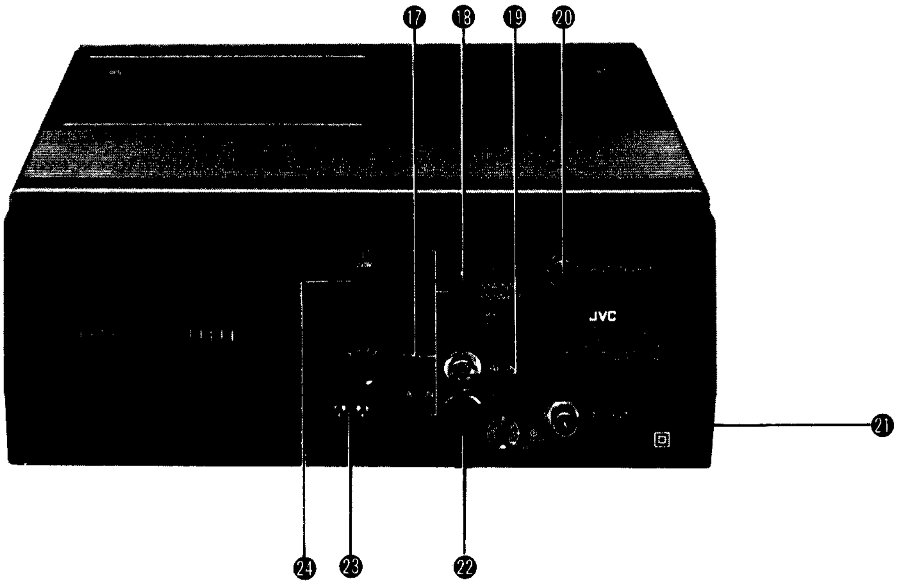
- Do not position the unit vertically or upside down.
- Do not subject the unit to shocks. Exercise special care while carrying it.
- Do not carry the unit while it remains attached to the recorder. Be sure to disconnect it from the recorder to avoid any possible danger.
- Avoid using the unit under the following conditions:
  - Extremely hot or cold places
  - Places subject to excessive humidity
  - Places subject to excessive vibrations

Maintenance

To clean the cabinet, wipe with a soft cloth. Do not use thinner or benzine, as these may damage the surface finish of the cabinet or blur the timer display. If the cabinet becomes extremely dirty, first wipe with a soft cloth soaked in a diluted neutral cleaning agent and then apply a dry cloth.

CONTROLS AND CONNECTORS





Front panel

1. **Channel lock indicator**
   Lights when the CHANNEL LOCK button is pressed in, indicating that the selected channel has been locked so that touching the channel select buttons has no effect.
2. **CHANNEL LOCK button**
   When this button is pressed ON, the selected channel is locked so that it remains engaged even if any of the channel select buttons is touched by accident.
   Convenient for timer recording. Normally set to OFF, and you can select any channel by pressing the corresponding channel select button.
3. **TIMER record button**
   Press this button after you have set the recorder for unattended timer recording. With this button pressed in, the power is switched on and off at that time specified with the built-in timer.
4. **Sub-power OFF button**
   Press this button to switch off the power to the unit. Pressing this button has no effect on the clock section.
5. **Sub-power ON button**
   Press this button to apply power to the unit. When this button is pressed in, the LED indicator above the ON button lights.

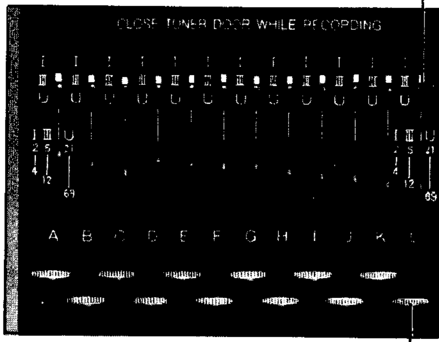
6. **CHARGE START button**
   Press this button to apply power to the connected HR-2200EG recorder for recharging the installed Ni-Cd battery pack.
7. **CLOCK set button**
   For setting the clock time.
8. **START set button**
   For setting the power switch-on time.
9. **STOP set button**
   For setting the power switch-off time.
   - If these buttons (STOP and START) are pressed simultaneously, the connected HR-2200EG which has been set for timer recording will start immediately.
10. **DAY set button**
    For setting the preselected day.
11. **Fluorescent-tube-display clock dial**
    24-Hour time indication.
12. **MINUTE/DAY button**
    For setting the minute indication to the correct time and the timer to the switch-on/off time. Also used to set to the preselected day.
13. **HOUR/SERIAL button**
    For setting the hour indication to the correct time and the timer to the switch-on/off time. Also used to enter the "repeat" command to record a serial daily TV show.
14. **Channel indicators**
    Light when the corresponding button is pressed to show which channel has been selected for recording.
15. **Channel select buttons**
    Press the one which corresponds to the channel you want to record.
16. **Channel pre-tuning section**

Rear Panel

17. **FUSE holder**
18. **MAINS POWER switch**
    Switching ON applies power to the unit. To switch off the unit completely, set the MAINS POWER switch to OFF. This switches off the timer clock and cancels all preset programming data. This also switches off the built-in antenna circuit so that the TV receiver connected to the TU-22EG will not be able to receive off-air TV programmes for good viewing condition. Normally set this MAINS POWER switch to ON.
19. **RF IN connector**
    Connect to the RF OUT connector of the HR-2200EG.
20. **Antenna input terminal (ANTENNA IN)**
    Connect the antenna cable from the antenna.
21. **RF OUT connector**
    Connect to the antenna terminal of your TV receiver.
22. **VCR cord**
    Connect to the TUNER/AC ADAPTER connector of the HR-2200EG portable recorder. Same connection can be used to recharge a battery pack installed within the HR-2200EG.
23. **AC input connector (AC∿ IN)**
    Connect the AC power cord to this connector.
24. **Voltage selector**
    The preset voltage is indicated in the window. If it differs from your local power supply voltage, reset it. See "POWER SYSTEM" on page 1.

Pre-tuning section

VHF/UHF band selector
I: For tuning to low VHF channels 2 through 4.
III: For tuning to high VHF channels 5 through 12.
U : For tuning to UHF channels 21 through 69.



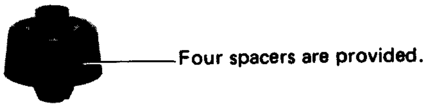
Tuning control
Turn in either direction to tune in to a desired station.

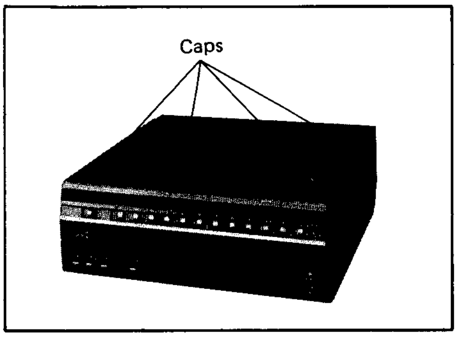
Tuning indicator
Moves up or down by turning the corresponding tuning control to roughly indicate the station to which the corresponding channel selector is tuned.

PLACING THE HR-2200EG AND THE TU-22EG IN A STACK ARRANGEMENT

The HR-2200EG can be placed on top of the TU-22EG in stack configuration for space saving installation.

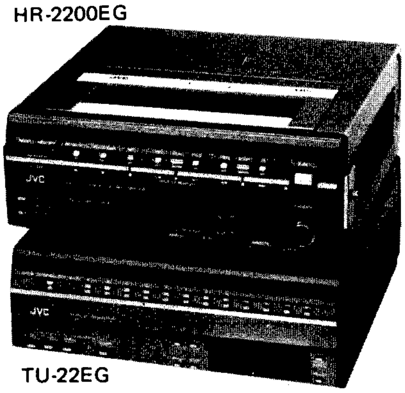
- For this purpose, employ the four spacers provided.





1. Remove the four caps on the top panel of the TU-22EG.

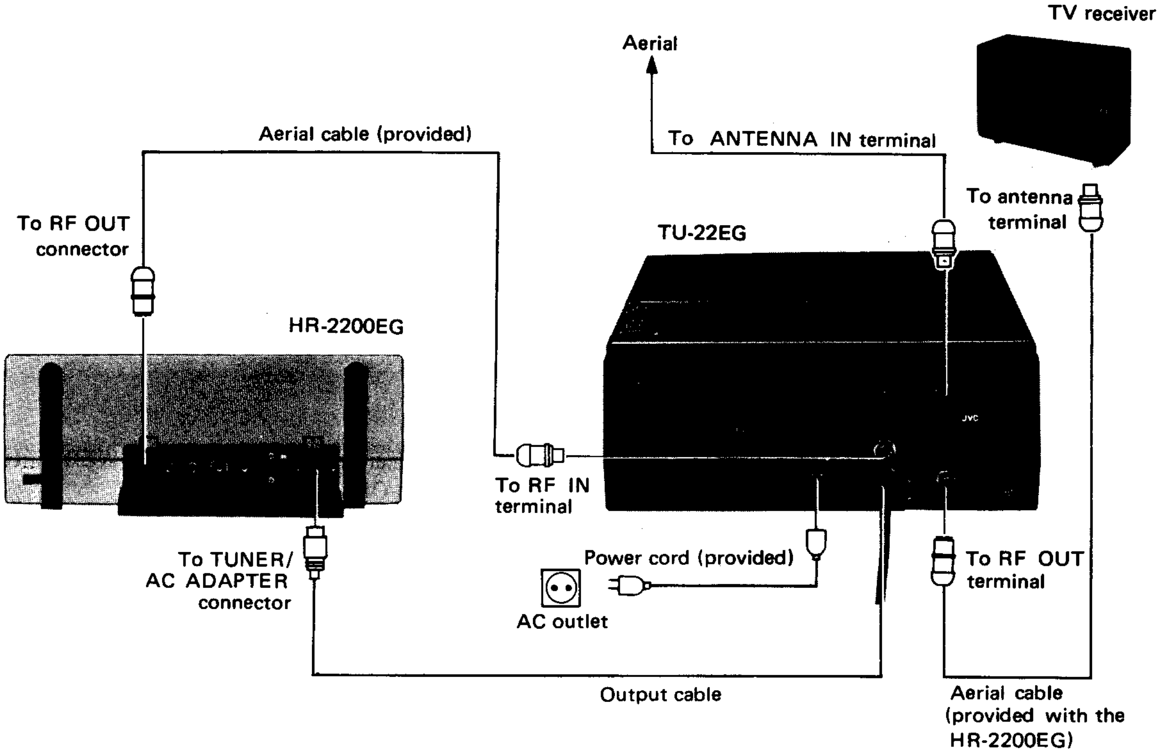
2. Insert the spacers into the holes from which the caps have been removed.



3. Position the HR-2200EG on the TU-22EG squarely.

Caution
When using the HR-2200EG and the TU-22EG in this stack configuration, be sure to use the provided spacers. Direct placement will obstruct heat ventilation from the TU-22EG, causing damage to the TU-22EG.

CONNECTIONS


TV receiver
Aerial
Aerial cable (provided)
To ANTENNA IN terminal
To antenna terminal
To RF OUT connector
TU-22EG
HR-2200EG
To RF IN terminal
To TUNER/ AC ADAPTER connector
Power cord (provided)
AC outlet
To RF OUT terminal
Output cable
Aerial cable (provided with the HR-2200EG)

Using the HR-2200EG colour portable recorder

1. Disconnect the aerial cable from the TV receiver.
2. Re-connect it to the TU-22EG as illustrated.
3. Connect the TU-22EG to the TV receiver as illustrated.
4. Connect the TU-22EG to the HR-2200EG using the aerial cable (provided) and the output cable of the TU-22EG.
5. Connect the power cord (provided) to an AC outlet.

Cables

Description	Connection	Availability
Aerial cable	Between HR-2200EG and TU-22EG	Provided with the TU-22EG
Aerial cable	Between TU-22EG and TV receiver	Provided with the HR-2200EG

TV receiver adjustment

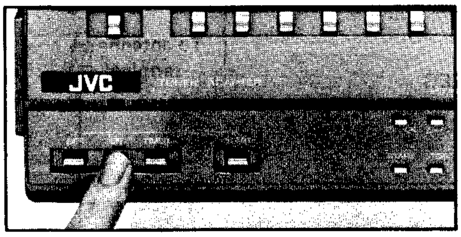
Your system is now ready to record off-air TV programmes onto the HR-2200EG and to play back the recorded programmes. Since the aerial input is supplied to the TV receiver through the TU-22EG, you can also use the TV receiver in an ordinary way. The channel of the RF converter built into the HR-2200EG is preset to UHF channel 36. If channel 36 is employed for broadcasting, reset the converter channel to one of the vacant channels between 32 and 40 as follows:

1. Adjust the TV receiver channel to one of the vacant channels.
2. Connect a video camera to the HR-2200EG and switch the power on for the recorder.
3. While monitoring the camera signal on the TV screen, turn the screw at the RF converter channel select switch in either direction so that the monitored picture comes in most clearly.

- It's possible to adjust the playback picture on the TV receiver using a prerecorded tape.
- When you wish to view video cassette programmes, always set the TV receiver's channel selector to your VIDEO CHANNEL.
- If you have already made adjustment of the RF converter in the HR-2200EG, re-adjustment is not necessary.

PRE-TUNING

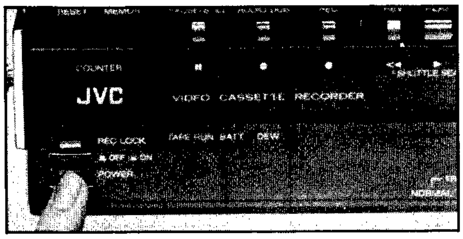
The tuning controls have been preset to predetermined channels prior to shipment. If you want to change these preset channels, proceed as follows:



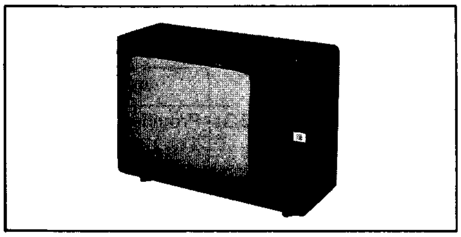
Preparations

- Connect a TV receiver and the HR-2200EG recorder to this unit (TU-22EG).
- Set the rear panel MAINS POWER switch to ON.

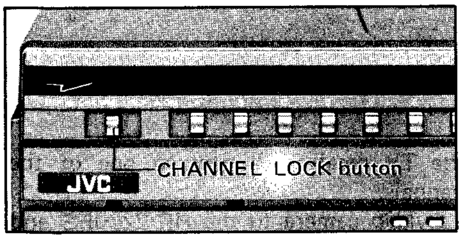
1. Press the sub-power ON button of the TU-22EG.



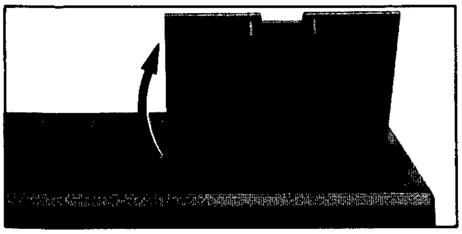
2. Turn on the TV receiver and press the POWER button of the HR-2200EG to ON.



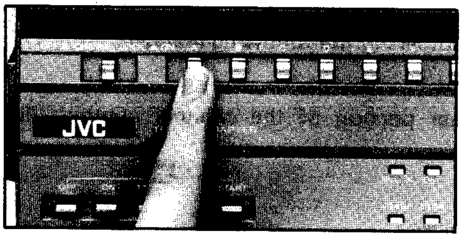
3. Set the TV receiver channel to the output channel of the RF converter built into the HR-2200EG. (your video channel)



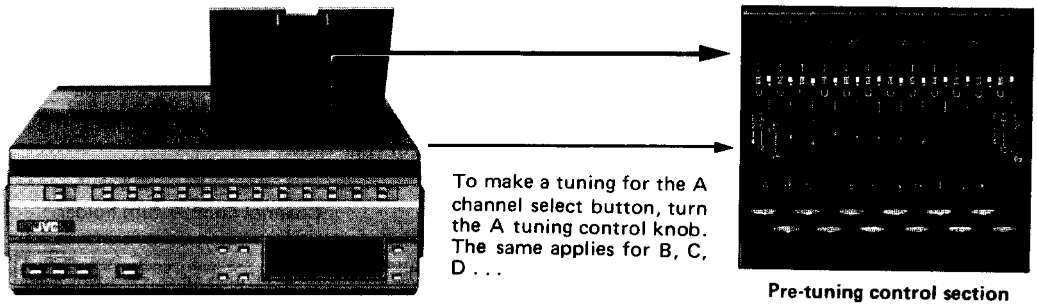
4. Make sure that the CHANNEL LOCK indicator does not light.
   - If it lights, press the CHANNEL LOCK button for OFF.



5. Lift up the lid of the pre-tuning control section.

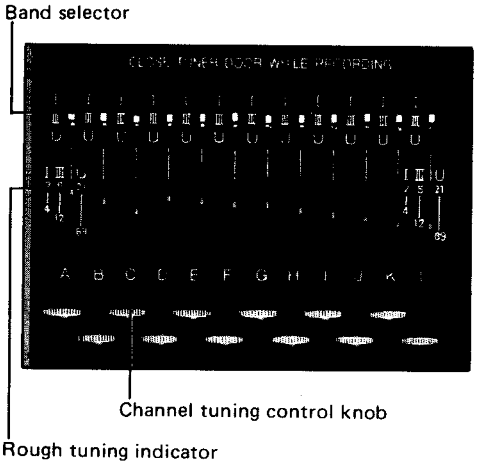


6. Press the channel select button which you've chosen to allocate for the station to be pre-tuned in. The corresponding channel indicator will illuminate.
   - The channel select buttons and the tuning control knobs are labelled with corresponding alphabetical letters to facilitate identifying each pair.



To make a tuning for the A channel select button, turn the A tuning control knob. The same applies for B, C, D . . .

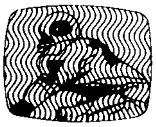
Pre-tuning control section



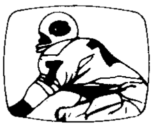
7. Set the VHF/UHF band selector as required.
   - Set to I when tuning in to low VHF channels 2 through 4.
   - Set to III when tuning in to high VHF channels 5 through 12.
   - Set to U when tuning in to UHF channels 21 through 69.

8. Tune in to a desired station by turning the corresponding tuning control knob while observing the TV screen.
   - Turning the tuning control in either direction moves the rough indicator vertically.

9. To obtain the best possible picture, make further adjustments.



Striped picture



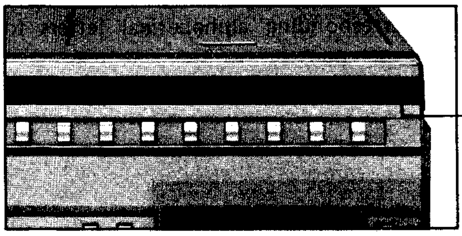
Clear picture

   - Turn the tuning control knob first until you get the striped picture, and then slowly turn, little by little, to clear up the picture.

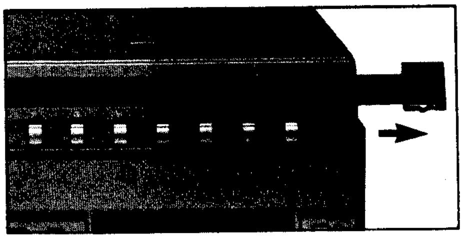
10. Perform the same adjustments, steps 6 through 9 , for each of the other channels. After completion of all necessary adjustments, close the lid of the pre-tuning control section.

REPLACING THE CHANNEL NUMBERS

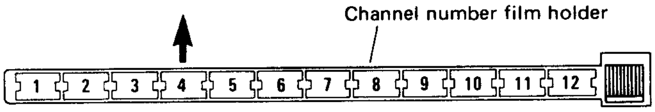
Prior to shipment, the channels on the channel indicator panel are numbered 1 through 12 from the left to the right. If you have changed the preset channels, replace the channel numbers in the following manner:

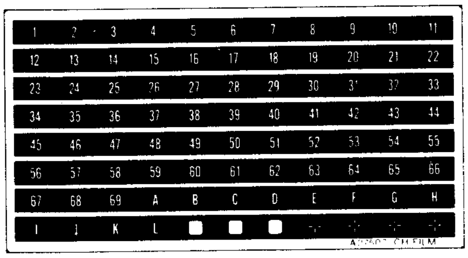

Channel number film holder

1. Disengage the stopper portion of the channel number film holder.

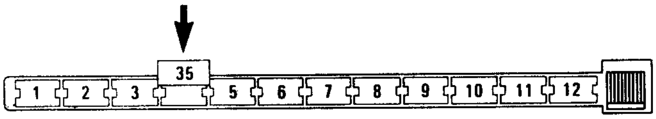


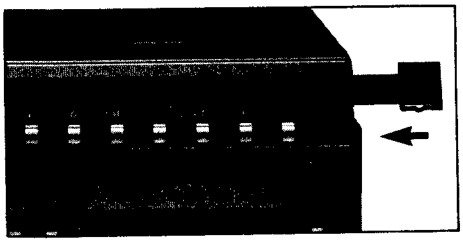
2. Pull out the channel number film holder and remove the no-longer-appropriate number film.


Channel number film holder
1 2 3 4 5 6 7 8 9 10 11 12

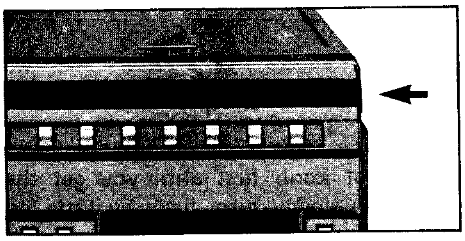

1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41 42 43 44
45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66
67 68 69 A B C D E F G H
I J K L

3. Separate the appropriate number film from the provided channel indicator film sheet by twisting it. Insert it into the channel number holder.


35
1 2 3 5 6 7 8 9 10 11 12

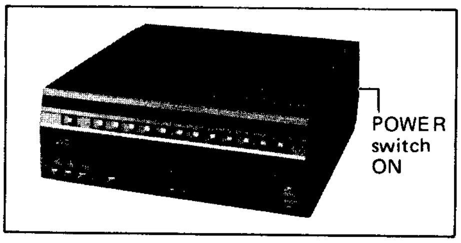


4. Reinsert the channel number holder so that the numbers are clearly visible.



5. Engage the stopper portion completely.

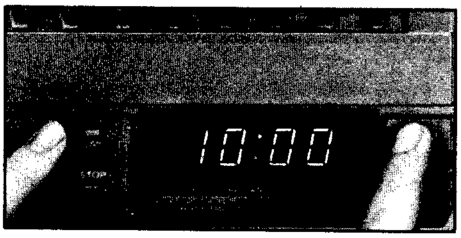
TIMER/CLOCK SETTING



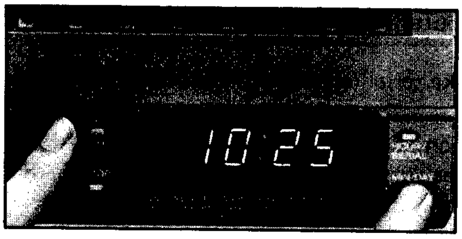
Setting the clock

Connect the power cord to an AC wall outlet, and set the rear panel MAINS POWER switch to ON.

- The timer continues to function as long as the power cord is plugged in and the rear panel MAINS POWER switch is set to ON, regardless of the setting of the front panel ON and OFF buttons.



1. While holding the CLOCK button pressed in, press the HOUR/SERIAL button until the correct hour indication is reached.
   - For example, press until 10:00 is reached for 10 o'clock in the morning and until 22:00 is reached for 10 o'clock in the evening.



2. While holding the CLOCK button pressed in, press the MIN/DAY button until the correct minute indication is reached.
   - For example, press until 10:25 is reached for 10:25 in the morning and until 22:25 is reached for 10:25 in the evening.

Releasing the CLOCK button starts time-keeping.

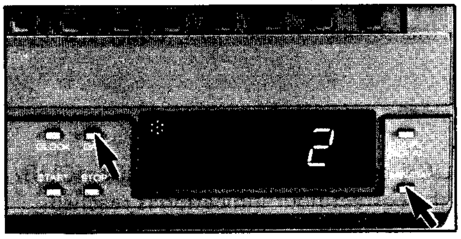
Holding the HOUR/SERIAL or MIN/DAY button pressed continuously advances the hour or minute indication automatically. Pressing either of them once advances it in single increments only.

For accurate time setting
Advance the time indication to one minute ahead of the present time. Wait for the time signal (from radio or TV) while holding the CLOCK button pressed. Release the button at the exact instant of the time signal, and the timer clock will be set accurately to the present time.

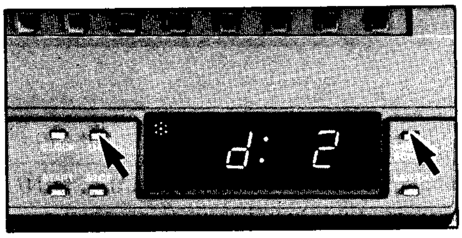
Setting the timer

The built-in timer permits setting of the day, switch-on time and switch-off time. When the preset switch-on time on the preselected day is reached, the TU-22EG starts providing power and signals to be recorded to the connected HR-2200EG recorder and, at the preset switch-off time, it discontinues providing power and signals.

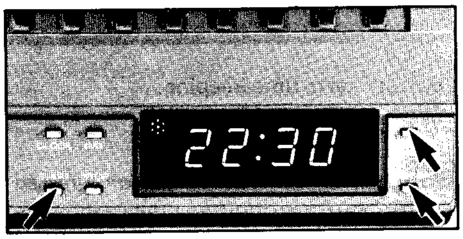
- First determine the number of days in advance and at what time the video system should start and what time it should switch off. Setting is performed in the sequence of "day", "single or serial", "switch-on time" and "switch-off time".



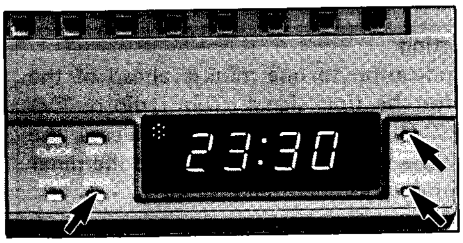
1. While holding the DAY button pressed, press the MIN/DAY button until a figure corresponding to the number of days appears on the display.
   - "0" corresponds to the current day of setting, "1" the next day, "2" the day after next . . . Possible up to "9".



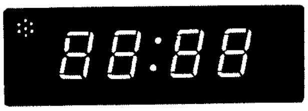
2. Press the DAY and HOUR/SERIAL buttons simultaneously.
   - If the d sign appears on the display, automatic recording will be performed repeatedly at the preset time starting on the preset day.
   - The d sign alternately appears and disappears when the HOUR/SERIAL button is pressed together with the DAY button.
   - If you wish to make serial recordings, obtain this d sign.



3. To set the switch-on time, press the HOUR/SERIAL or MIN/DAY button as required while holding the START button pressed.



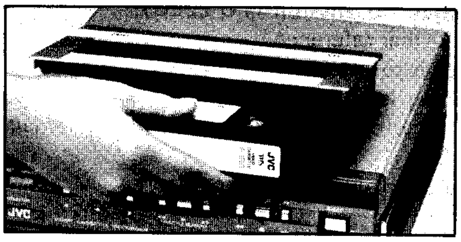
4. To set the switch-off time, press the HOUR/SERIAL or MIN/DAY button as required, while holding the STOP button pressed.



Power failure indicator

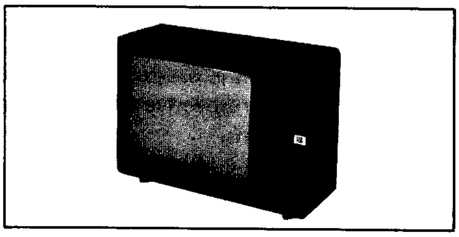
The entire clock display may start to flicker fast. This is not a malfunctioning of the timer, but it indicates that there has been a power failure. Re-adjusting the time restores the normal condition of the clock display.

RECORDING TV PROGRAMMES

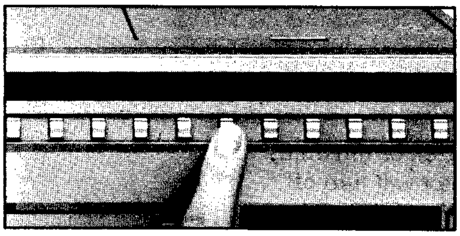


- Connect the TV receiver and the HR-2200EG to this unit (TU-22EG). (Refer to page 6 for further details.)
- Turn all power switches to ON for each unit.

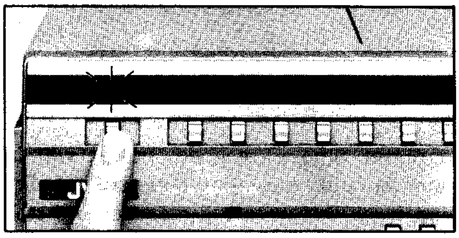
1. Load a video cassette into the recorder.



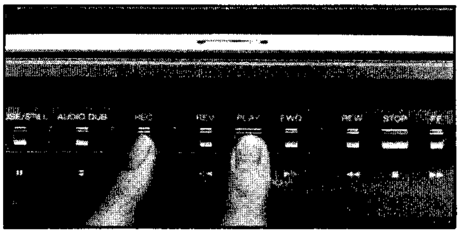
2. Set the TV receiver channel selector to the channel of the RF converter built into the recorder. (your video channel).



3. Press the channel select button corresponding to the programme which you wish to record.



4. Press the CHANNEL LOCK button to ON.
   - The channel lock indicator will light to show that the selected channel is "locked" so that it remains engaged irrespective of accidental touching of the channel select buttons.



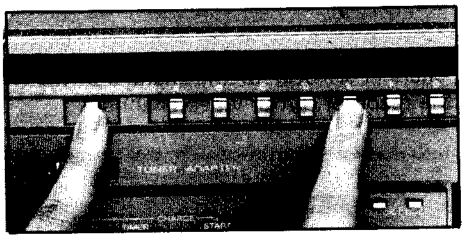
5. Press the REC and PLAY buttons of the recorder simultaneously.
   - Recording of the selected TV programme will start and at the same time the picture will appear on the TV screen.

To record one TV programme while watching another
Set the TU-22EG for recording one TV programme in the same manner described in steps 1 through 5 and set the TV receiver channel selector to any other channel you wish to view.

TIMER RECORDING

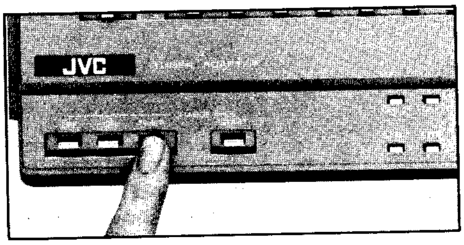
- Connect the HR-2200EG to this unit (TU-22EG). (Refer to page 6 for further reference.)
- Turn the power switches to ON for these units. If unattended recording is to be done and there is no need for monitoring the picture, the TV receiver should remain OFF (if connected).

1. Load a video cassette correctly into the recorder.

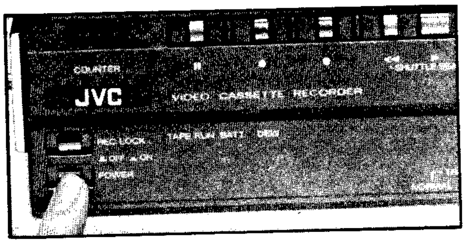


2. Press the channel select button corresponding to the programme you wish to record. Press the CHANNEL LOCK button to ON.
   - The channel lock indicator will light.
   - When the CHANNEL LOCK button is pressed to ON, the selected channel remains engaged irrespective of accidental touching of the channel select buttons.

3. Set the timer as required. (For details, see page 11.)



4. Press the TIMER button of this unit.
   - The power indicator will turn off.
   - The STOP indicator of the recorder will also turn off.
   - If you wish to view TV programmes during timer recording, set the TV receiver channel selector to the channel you wish to watch.



5. Make sure that the POWER button of the HR-2200EG is pressed to ON.
   - When the desired preset time is reached, power will be applied to the recorder and, due to the timer recording start signal supplied from this unit, the recorder will start recording automatically.
   - There is no need to press the REC and PLAY buttons to engage the Record Standby mode.

To utilize only the timer switch-off function

- This usage is convenient to stop recording automatically a certain period after you have started recording manually.
- Set the units for timer recording following steps 1 through 5.
- Then press the STOP and START set buttons simultaneously.
- This will start recording immediately. And when the preset switch-off time is reached, the recorder stops automatically.

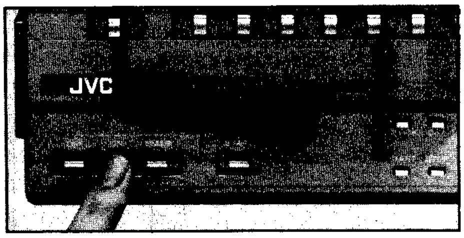
Notes

• **After timer recording**	Press the front panel sub-power OFF button of this unit.
• **If there is a power failure during timer recording**	The selected channel will be released and instead a programme corresponding to the A channel will be recorded. The flickering clock dial will indicate the occurrence of a power failure.

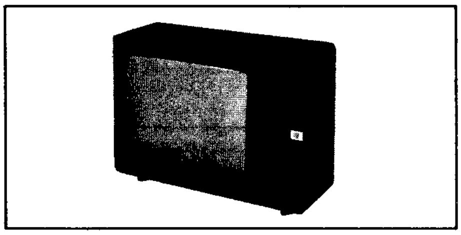
PLAYBACK

- Connect a TV receiver and the HR-2200EG to this unit (TU-22EG).

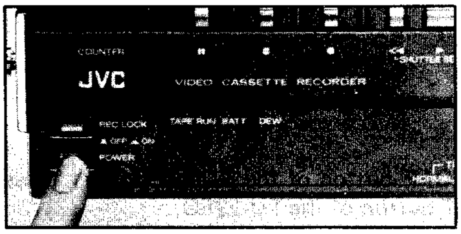
1. Load a pre-recorded cassette into the recorder.



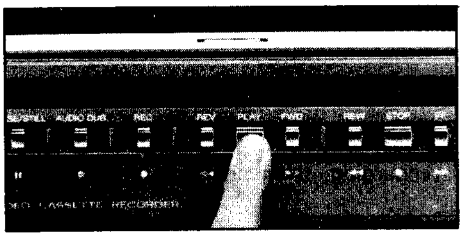
2. Press the sub-power ON button of this unit.



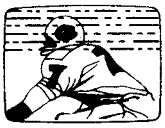
3. Set the TV receiver channel selector to the same channel of the RF converter in the recorder.



4. Press the POWER button of the recorder to ON.



5. Press the PLAY button of the recorder.
   - Playback of the recorded material will start and the picture will appear on the TV screen.



Note

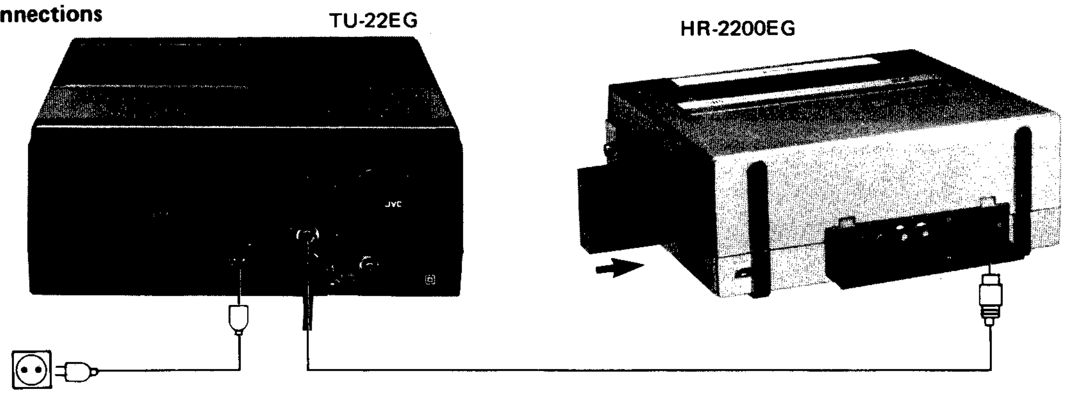
If the playback picture contains noise bars . . .

Is the TRACKING NORMAL control of the recorder properly adjusted? Turn the knob to centre until a click is heard. If noise bars still appear, turn the knob slowly in either direction until they move out of the screen. Recording should always be done with this control returned to centre.

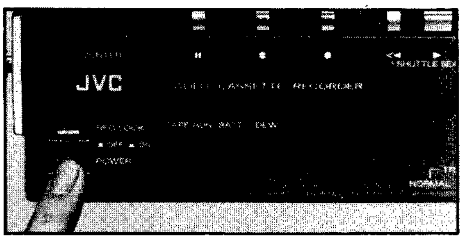
RECHARGING THE BATTERY PACK(NB-P1)

The TU-22EG can serve as a recharging unit for the Ni-Cd battery pack, NB-P1, when it is installed within the HR-2200EG recorder.

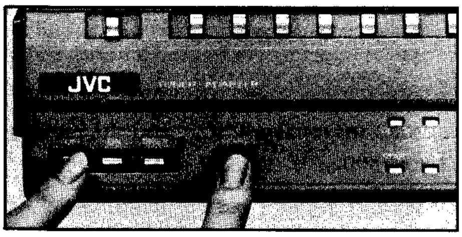
Connections



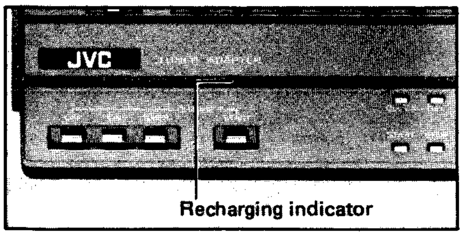
- Install the battery pack NB-P1 into the HR-2200EG.
- Press the front panel sub-power OFF button of the TU-22EG when making this connection.
- While recharging, the recorder cannot be operated.



1. Set the recorder to the Stop mode and the POWER button to OFF.



2. Press the sub-power OFF button of the TU-22EG. Then press the CHARGE START button of the TU-22EG.
   - Recharging will start now with the indicator lighting.



3. Upon completion of recharging, the recharging indicator will go out.

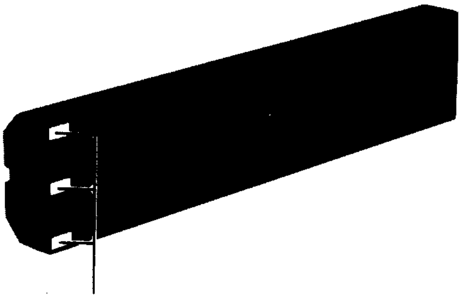
To prevent moisture condensation
The TU-22EG incorporates a power supply for the moisture condensation prevention heater which is built into the HR-2200EG.

- If the POWER button of the HR-2200EG is set to OFF and the sub-power OFF button of the TU-22EG is pressed, the moisture condensation prevention heater inside the HR-2200EG is powered.
  However, if for some reason you are not using the HR-2200EG for a long period of time, it is advisable to remove the power cord of the TU-22EG from the AC outlet.

CAUTIONS REGARDING THE BATTERY PACK AND RECHARGING

The NB-P1 is a nickel-cadmium (Ni-Cd) battery. Give attention to the following to make the most of its characteristics.

- Before use, fully recharge the battery pack.
- Even when you are not using the battery pack, it will gradually discharge of itself. This natural discharging is accelerated as the ambient temperature rises.
  Therefore, it is recommended that you store the battery pack at a place of low temperatures.
- Do not discard the battery pack into a fire nor leave it continuously exposed to high temperatures.
- The battery may not be 100 % rechargeable immediately after its natural discharge, since it has been inactivated. Repeat the recharge/discharge procedures two to three times in such a case, so as to restore the full efficiency of the battery.
- The battery pack has its own service life. If its operating time becomes exceedingly short even though you recharge it correctly, it means that the battery pack is nearing the end of its service life. Replace with a fresh one in such cases.
- Do not disassemble or remodel the battery pack.



- **Do not short-circuit the terminals**
  If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe with a piece of soft cloth.

- The average recharging time takes about 90 minutes per battery pack.

  (The recharging time is based on room temperature of 20°C with a power supply of 220 V. The lower the temperature, the longer the recharging time.)

Temperature ranges of the battery pack:

For recharging:	10°C to 35°C
For operating:	-10°C to 40°C
For storing:	-10°C to 30°C

IN CASE OF DIFFICULTY

Symptoms	Check points
No power is applied to the TU-22EG.	● Is the power cord connected? ● Is the rear panel MAINS POWER switch set to ON?
No power is applied to the HR-2200EG.	● Make sure that the output cord of the TU-22EG is connected to the TUNER/AC ADAPTER connector of the HR-2200EG.
Recording is impossible.	● Are all connections made correctly? – See page 6. ● Is the safety tab of the cassette in place? – If not, reseal the slot. ● Is the right procedure being followed? – See page 12.
Timer recording is impossible.	● Has the timer been correctly set? – See page 11. ● Has the right procedure been followed? – See page 13.
Playback is impossible.	● Are all connections made correctly? ● Is the TV receiver channel selector set to the RF converter channel? ● Is the operating procedure accurately followed? See page 14.

SPECIFICATIONS

General

Power requirement : 110/127/220/240 V∿, 50/60 Hz
Power consumption : 63 watts
Weight : 5.0 kg
Dimensions : 27.4(W) x 10.3(H) x 30.4(D) cm
Temperature
  Operating : 0° to 40°C
  Storage : -20°C to 60°C

Tuner section

Channel coverage : VHF 2 – 4 (Band I)
VHF 5 – 12 (Band III)
UHF 21 – 69 (Band IV/V)
RF output : Direct from the HR-2200EG
Video output : 1.0 Vp-p, 75 ohms
Audio output : -14 dBs (open load)

Timer section

Clock/timer indication : 24-hour fluorescent digital indication
Clock reference : Power line frequency (50/60 Hz)
Timer start setting : Within the coming 10 days
Timer stop setting : Anytime within 24 hours from start time

AC power adapter/charger section

Rated output voltage : 12 V DC
Rated output current : Less than 1.8 A (adapter mode)
Battery pack to be charged : Exclusive Ni-Cd battery pack, NB-P1
Charging indicator : Provided
Provided accessories : Cable ass'y, Power cord
Channel number indication film sheet
Spacer x 4

Design and specifications subject to change without notice.

IMPORTANT (In the United Kingdom) Mains Supply (AC 240 V∿, 50 Hz only)

IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:

Blue to N (Neutral) or Black
Brown to L (Live) or Red

If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black. Brown wire to terminal coded L (Live) or coloured Red.
If in doubt – consult a competent electrician.

Note
This equipment should be disconnected from the mains when in not use.

POWER SYSTEM

Connection to the mains supply
The operating voltage of this set is preset to 240 V∿ at the factory.
Before connecting to mains, check that the voltage selector on the rear panel is set to the same voltage as your local mains supply.

Adapting to local power line
This set operates on either 110, 127, 220 or 240 V∿. If the preset voltage is different from the power line voltage in your area, reset the voltage selector by inserting a screwdriver into the slot of the voltage selector and turning it until the correct voltage is displayed.

WARNING: Recording and playback of material may require consent. See copyright Act 1956 and Performers Protection Act 1958 – 1972.

MAINS POWER SWITCH

The mains switch is located on the rear connector panel. Setting this switch to OFF removes all applied power from the set including the timer clock. Switching on and off the tuner section is performed with the front panel sub-power ON/OFF buttons.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

CAUTION

Dangerous voltage inside. Refer internal servicing to qualified service personnel. To prevent electric shock or fire hazard, remove the power cord from the AC outlet prior to connecting or disconnecting any signal lead or aerial, prior to replacing the fuse, and prior to altering the voltage setting.

Note:
The rating plate is on the rear of the unit.

Thank you for purchasing the JVC TU-22EK Tuner/Adapter. This unit enables off-air TV programmes to be recorded with the JVC HR-2200EK portable video cassette recorder. It also permits other functions such as automatic unattended recording of TV programmes with its built-in timer and permits quick-charging of the NB-P1 Ni-Cd battery pack installed in the HR-2200EK.

To obtain the best performance and greatest utilization from your TU-22EK, read this instruction booklet completely and carefully.

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Features 2
Precautions 2
Controls and connectors 3
Placing the HR-2200EK and the TU-22EK
in a stack arrangement 5
Connections 6
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Timer/clock setting 10
Recording TV programmes 12
Timer recording 13
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In case of difficulty 17
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FEATURES

- The built-in timer enables switching on and off at desired preset times during any one of 10 days in advance, including the day of setting.
- 12-Channel electronic TV tuner having pushbutton (feather-light touch) channel selectors.
- Channel lock mechanism for preventing the selected channel from being changed by accidentally touching the channel selectors.
- Serves as an AC power adapter for the HR-2200EK portable recorder.
- Quick-charging function for the NB-P1 Ni-Cd battery pack installed in the HR-2200EK.

PRECAUTIONS

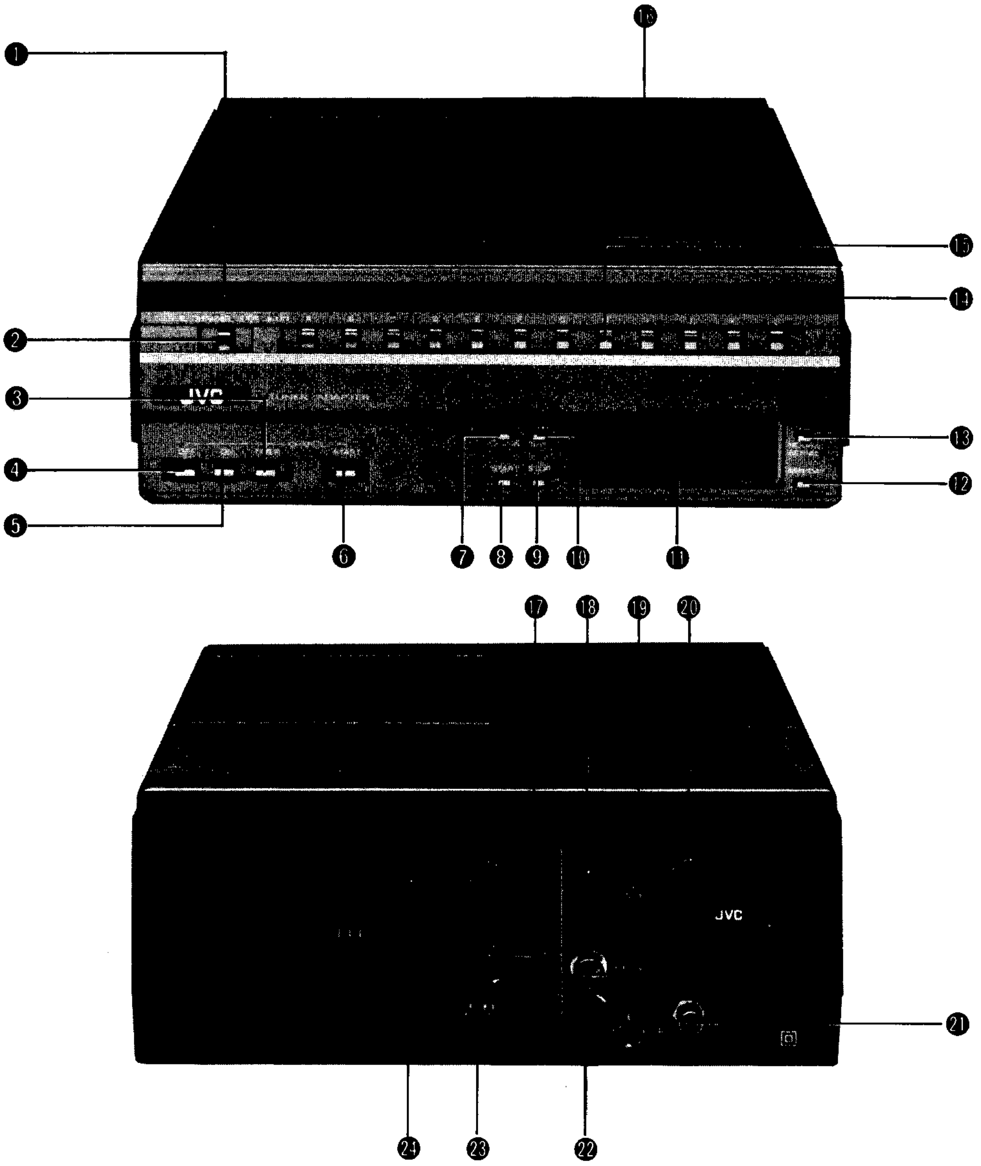
- Prevent inflammables, water and metallic objects from entering the TU-22EK unit.
- Do not remodel or disassemble the unit. To do so is dangerous and damage may result.
- Do not damage the power cord as this could cause electrical shocks.
- Remove the AC power cord from the AC outlet when you are not using the unit for a long period.

If malfunctioning occurs, discontinue using the unit immediately, unplug it from the AC outlet and consult your local JVC dealer.

- Do not position the unit vertically or upside down.
- Do not subject the unit to shocks. Exercise special care while carrying it.
- Do not carry the unit while it remains attached to the recorder. Be sure to disconnect it from the recorder to avoid any possible danger.
- Avoid using the unit under the following conditions:
  - Extremely hot or cold places
  - Places subject to excessive humidity
  - Places subject to excessive vibrations

Maintenance
To clean the cabinet, wipe with a soft cloth. Do not use thinner or benzine, as these may damage the surface finish of the cabinet or blur the timer display. If the cabinet becomes extremely dirty, first wipe with a soft cloth soaked in a diluted neutral cleaning agent and then apply a dry cloth.

CONTROLS AND CONNECTORS



Front panel

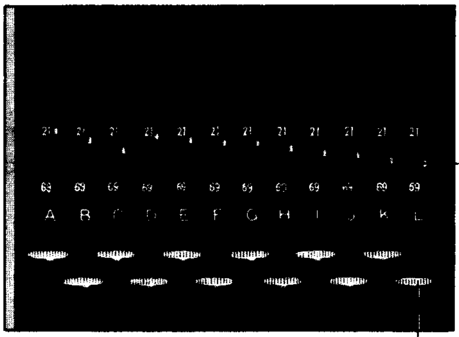
1. **Channel lock indicator**
   Lights when the CHANNEL LOCK button is pressed in, indicating that the selected channel has been locked so that touching the channel select buttons has no effect.
2. **CHANNEL LOCK button**
   When this button is pressed ON, the selected channel is locked so that it remains engaged even if any of the channel select buttons is touched by accident.
   Convenient for timer recording. Normally set to OFF, and you can select any channel by pressing the corresponding channel select button.
3. **TIMER record button**
   Press this button after you have set the recorder for unattended timer recording. With this button pressed in, the power is switched on and off at that time specified with the built-in timer.
4. **Sub-power OFF button**
   Press this button to switch off the power to the unit. Pressing this button has no effect on the clock section.
5. **Sub-power ON button**
   Press this button to apply power to the unit. When this button is pressed in, the LED indicator above the ON button lights.

6. **CHARGE START button**
   Press this button to apply power to the connected HR-2200EK recorder for recharging the installed Ni-Cd battery pack.
7. **CLOCK set button**
   For setting the clock time.
8. **START set button**
   For setting the power switch-on time.
9. **STOP set button**
   For setting the power switch-off time.
   - If these buttons (STOP and START) are pressed simultaneously, the connected HR-2200EK which has been set for timer recording will start immediately.
10. **DAY set button**
    For setting the preselected day.
11. **Fluorescent-tube-display clock dial**
    24-Hour time indication.
12. **MINUTE/DAY button**
    For setting the minute indication to the correct time and the timer to the switch-on/off time. Also used to set to the preselected day.
13. **HOUR/SERIAL button**
    For setting the hour indication to the correct time and the timer to the switch-on/off time. Also used to enter .the "repeat" command to record a serial daily TV show.
14. **Channel indicators**
    Light when the corresponding button is pressed to show which channel has been selected for recording.
15. **Channel select buttons**
    Press the one which corresponds to the channel you want to record.
16. **Channel pre-tuning section**

Rear panel

17. **FUSE holder**
18. **MAINS POWER switch**
    Switching ON applies power to the unit. To switch off the unit completely, set the MAINS POWER switch to OFF. This switches off the timer clock and cancels all preset programming data. This also switches off the built-in antenna circuit so that the TV receiver connected to the TU-22EK will not be able to receive off-air TV programmes for good viewing condition. Normally set this MAINS POWER switch to ON.
19. **RF IN connector**
    Connect to the RF OUT connector of the HR-2200EK.
20. **Antenna input terminal (ANTENNA IN)**
    Connect the antenna cable from the antenna.
21. **RF OUT connector**
    Connect to the antenna terminal of your TV receiver.
22. **VCR cord**
    Connect to the TUNER/AC ADAPTER connector of the HR-2200EK portable recorder. Same connection can be used to recharge a battery pack installed within the HR-2200EK.
23. **AC input connector (AC∿ IN)**
    Connect the AC power cord to this connector.
24. **Voltage selector**
    The preset voltage is indicated in the window.
    If it differs from your local power supply voltage, reset it. See "POWER SYSTEM" on page 1.

Pre-tuning section



Tuning control
Turn in either direction to tune in to a desired station.

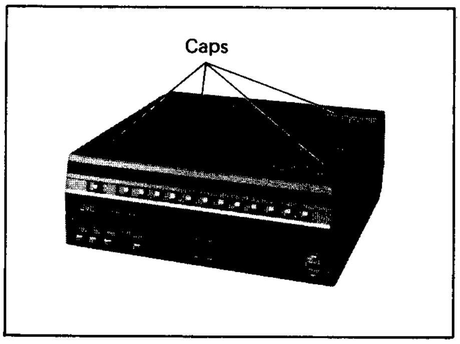
Tuning indicator
Moves up or down by turning the corresponding tuning control to roughly indicate the station to which the corresponding channel selector is tuned.

PLACING THE HR-2200EK AND THE TU-22EK IN A STACK ARRANGEMENT

The HR-2200EK can be placed on top of the TU-22EK in stack configuration for space saving installation.

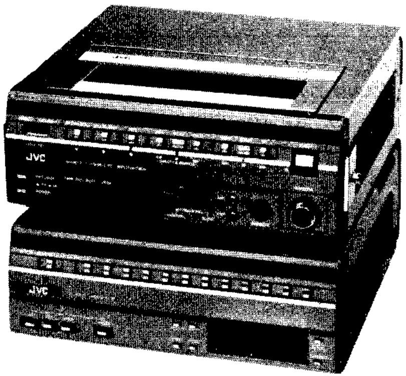
- For this purpose, employ the four spacers provided.

Four spacers are provided.



1. Remove the four caps on the top panel of the TU-22EK.

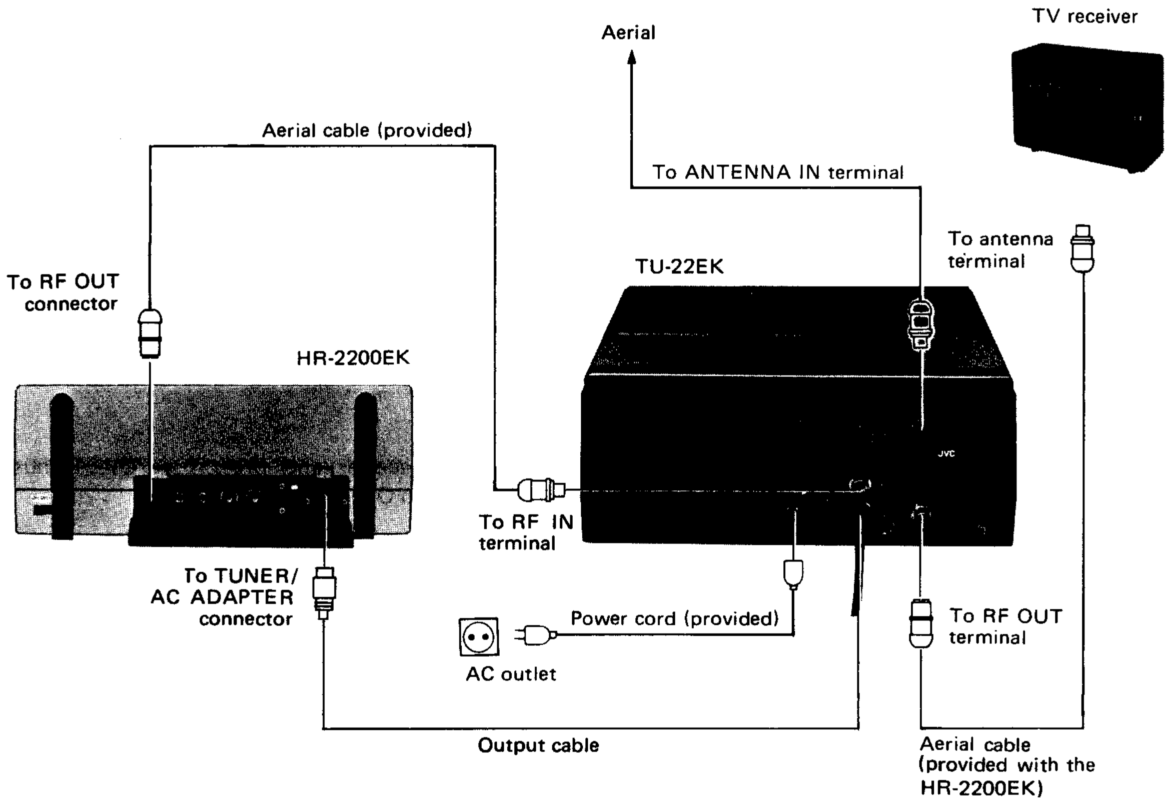
2. Insert the spacers into the holes from which the caps have been removed.



3. Position the HR-2200EK on the TU-22EK squarely.

Caution
When using the HR-2200EK and the TU-22EK in this stack configuration, be sure to use the provided spacers. Direct placement will obstruct heat ventilation from the TU-22EK, causing damage to the TU-22EK.

CONNECTIONS


TV receiver
Aerial
Aerial cable (provided)
To ANTENNA IN terminal
To antenna terminal
TU-22EK
To RF OUT connector
HR-2200EK
To RF IN terminal
To TUNER/ AC ADAPTER connector
Power cord (provided)
To RF OUT terminal
AC outlet
Output cable
Aerial cable (provided with the HR-2200EK)

Using the HR-2200EK colour portable recorder

1. Disconnect the aerial cable from the TV receiver.
2. Re-connect it to the TU-22EK as illustrated.
3. Connect the TU-22EK to the TV receiver as illustrated.
4. Connect the TU-22EK to the HR-2200EK using the aerial cable (provided) and the output cable of the TU-22EK.
5. Connect the power cord (provided) to an AC outlet.

Cables

Description	Connection	Availability
Aerial cable	Between HR-2200EK and TU-22EK	Provided with the TU-22EK
Aerial cable	Between TU-22EK and TV receiver	Provided with the HR-2200EK

TV receiver adjustment

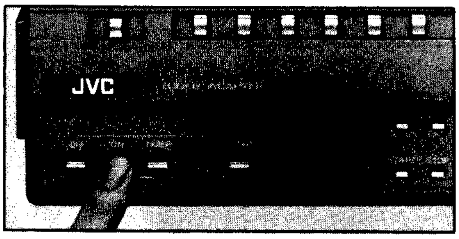
Your system is now ready to record off-air TV programmes onto the HR-2200EK and to play back the recorded programmes. Since the aerial input is supplied to the TV receiver through the TU-22EK, you can also use the TV receiver in an ordinary way. The channel of the RF converter built into the HR-2200EK is preset to UHF channel 36. If channel 36 is employed for broadcasting, reset the converter channel to one of the vacant channels between 32 and 40 as follows:

1. Adjust the TV receiver channel to one of the vacant channels.
2. Connect a video camera to the HR-2200EK and switch the power on for the recorder.
3. While monitoring the camera signal on the TV screen, turn the RF converter channel adjustment screw in either direction so that the monitored picture comes in most clearly.

- It's possible to adjust the playback picture on the TV receiver using a prerecorded tape.
- When you wish to view video cassette programmes, always set the TV receiver's channel selector to your VIDEO CHANNEL.
- If you have already made adjustment of the RF converter in the HR-2200EK, re-adjustment is not necessary.

PRE-TUNING

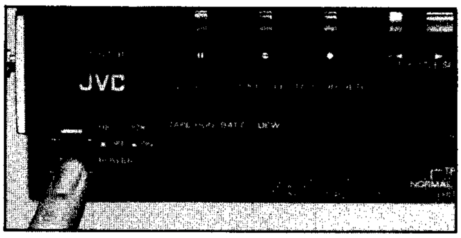
The tuning controls have been preset to predetermined channels prior to shipment. If you want to change these preset channels, proceed as follows:



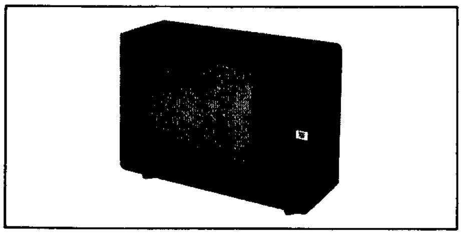
Preparations

- Connect a TV receiver and the HR-2200EK recorder to this unit (TU-22EK).
- Set the rear panel MAINS POWER switch to ON.

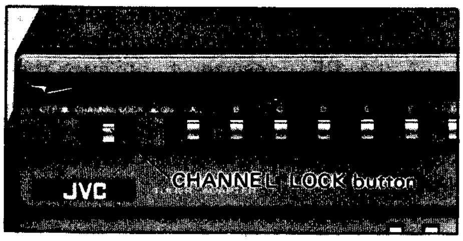
1. Press the sub-power ON button of the TU-22EK.



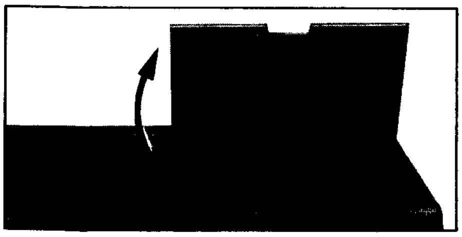
2. Turn on the TV receiver and press the POWER button of the HR-2200EK to ON.



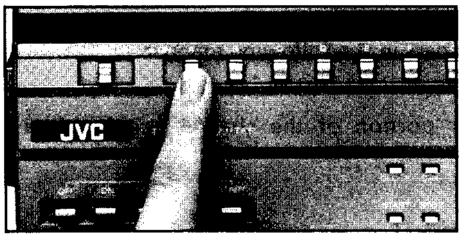
3. Set the TV receiver channel to the output channel of the RF converter built into the HR-2200EK (your video channel).



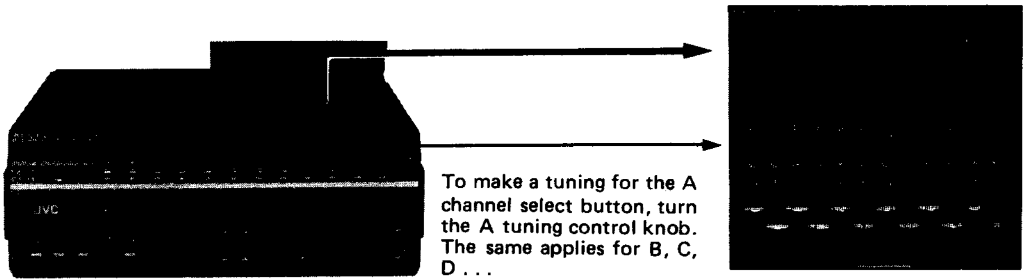
4. Make sure that the CHANNEL LOCK indicator does not light.
   - If it lights, press the CHANNEL LOCK button for OFF.



5. Lift up the lid of the pre-tuning control section.

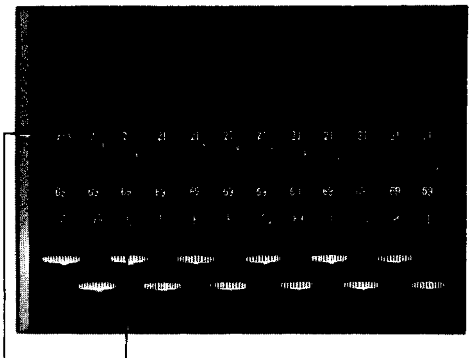


6. Press the channel select button which you've chosen to allocate for the station to be pre-tuned in. The corresponding channel indicator will illuminate.
   - The channel select buttons and the tuning control knobs are labelled with corresponding alphabetical letters to facilitate identifying each pair.



To make a tuning for the A channel select button, turn the A tuning control knob. The same applies for B, C, D . . .

Pre-tuning control section

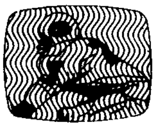


Channel tuning control knob

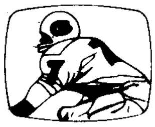
Rough tuning indicator

7. Tune in to a desired station by turning the corresponding tuning control knob while observing the TV screen.
   - Turning the tuning control in either direction moves the rough indicator vertically.

8. To obtain the best possible picture, make further adjustments.



Striped picture



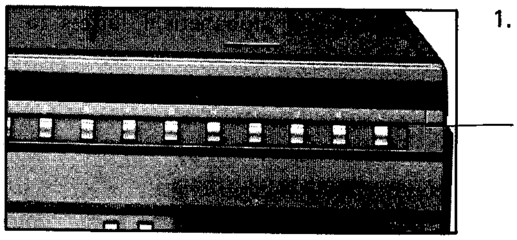
Clear picture

   - Turn the tuning control knob first until you get the striped picture, and then slowly turn, little by little, to clear up the picture.

9. Perform the same adjustments, steps 6 through 8, for each of the other channels. After completion of all necessary adjustments, close the lid of the pre-tuning control section.

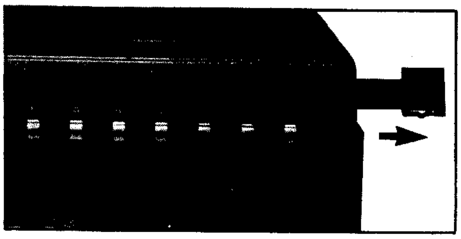
REPLACING THE CHANNEL NUMBERS

Prior to shipment, the channels on the channel indicator panel are numbered 1 through 12 from the left to the right. If you have changed the preset channels, replace the channel numbers in the following manner:

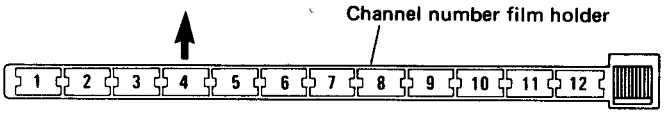


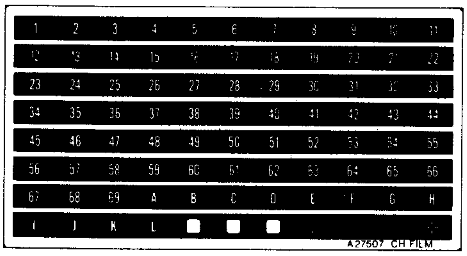
Channel number film holder

1. Disengage the stopper portion of the channel number film holder.

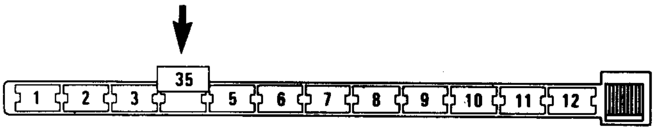


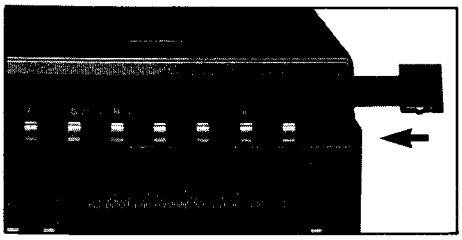
2. Pull out the channel number film holder and remove the no-longer-appropriate number film.


Channel number film holder
1
2
3
4
5
6
7
8
9
10
11
12

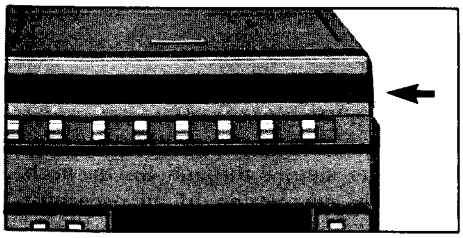

1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22
23 24 25 26 27 28 29 30 31 32 33
34 35 36 37 38 39 40 41 42 43 44
45 46 47 48 49 50 51 52 53 54 55
56 57 58 59 60 61 62 63 64 65 66
67 68 69 A B C D E F G H
I J K L
A27507 CH FILM

3. Separate the appropriate number film from the provided channel indicator film sheet by twisting it. Insert it into the channel number holder.


35
1
2
3
5
6
7
8
9
10
11
12

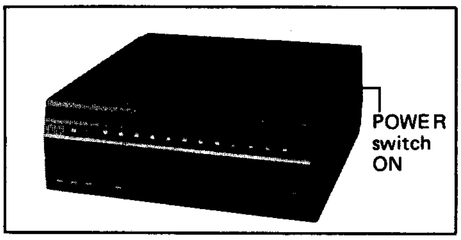


4. Reinsert the channel number holder so that the numbers are clearly visible.



5. Engage the stopper portion completely.

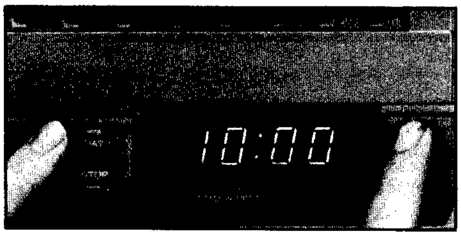
TIMER/CLOCK SETTING



Setting the clock

Connect the power cord to an AC wall outlet, and set the rear panel MAINS POWER switch to ON.

- The timer continues to function as long as the power cord is plugged in and the rear panel MAINS POWER switch is set to ON, regardless of the setting of the front panel ON and OFF buttons.



1. While holding the CLOCK button pressed in, press the HOUR/SERIAL button until the correct hour indication is reached.
   - For example, press until 10:00 is reached for 10 o'clock in the morning and until 22:00 is reached for 10 o'clock in the evening.

2. While holding the CLOCK button pressed in, press the MIN/DAY button until the correct minute indication is reached.
   - For example, press until 10:25 is reached for 10:25 in the morning and until 22:25 is reached for 10:25 in the evening.

Releasing the CLOCK button starts time-keeping.

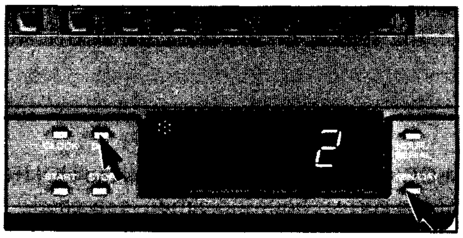
Holding the HOUR/SERIAL or MIN/DAY button pressed continuously advances the hour or minute indication automatically. Pressing either of them once advances it in single increments only.

For accurate time setting
Advance the time indication to one minute ahead of the present time. Wait for the time signal (from radio or TV) while holding the CLOCK button pressed. Release the button at the exact instant of the time signal, and the timer clock will be set accurately to the present time.

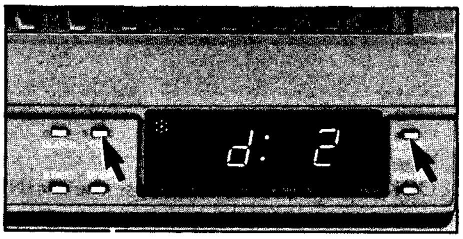
Setting the timer

The built-in timer permits setting of the day, switch-on time and switch-off time. When the preset switch-on time on the preselected day is reached, the TU-22EK starts providing power and signals to be recorded to the connected HR-2200EK recorder and, at the preset switch-off time, it discontinues providing power and signals.

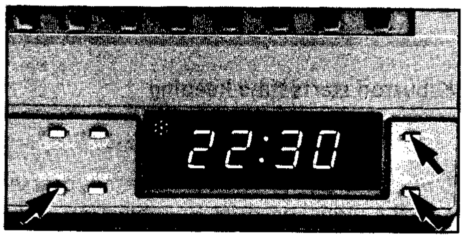
- First determine the number of days in advance and at what time the video system should start and what time it should switch off. Setting is performed in the sequence of "day", "single or serial", "switch-on time" and "switch-off time".



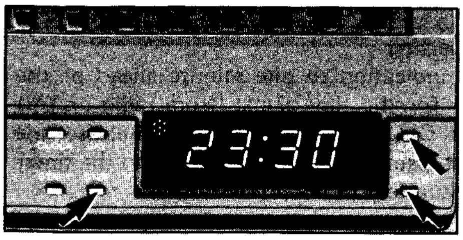
1. While holding the DAY button pressed, press the MIN/DAY button until a figure corresponding to the number of days appears on the display.
   - "0" corresponds to the current day of setting, "1" the next day, "2" the day after next . . . Possible up to "9".



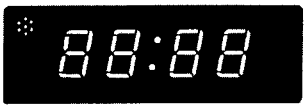
2. Press the DAY and HOUR/SERIAL buttons simultaneously.
   - If the *d* sign appears on the display, automatic recording will be performed repeatedly at the preset time starting on the preset day.
   - The *d* sign alternately appears and disappears when the HOUR/SERIAL button is pressed together with the DAY button.
   - If you wish to make serial recordings, obtain this *d* sign.



3. To set the switch-on time, press the HOUR/SERIAL or MIN/DAY button as required while holding the START button pressed.



4. To set the switch-off time, press the HOUR/SERIAL or MIN/DAY button as required, while holding the STOP button pressed.



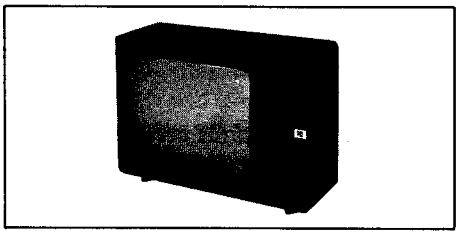
Power failure indicator

The entire clock display may start to flicker fast. This is not a malfunctioning of the timer, but it indicates that there has been a power failure. Re-adjusting the time restores the normal condition of the clock display.

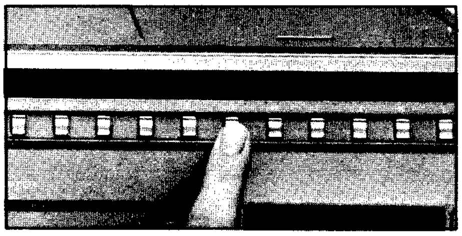
RECORDING TV PROGRAMMES

- Connect the TV receiver and the HR-2200EK to this unit (TU-22EK). (Refer to page 6 for further details.)
- Turn all power switches to ON for each unit.

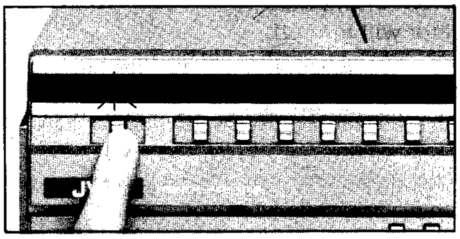
1. Load a video cassette into the recorder.



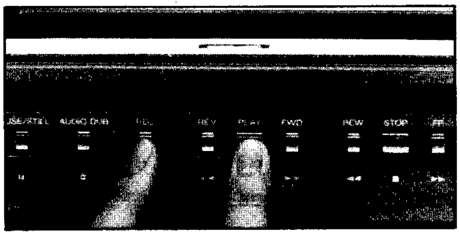
2. Set the TV receiver channel selector to the channel of the RF converter built into the recorder (your video channel).



3. Press the channel select button corresponding to the programme which you wish to record.



4. Press the CHANNEL LOCK button to ON.
   - The channel lock indicator will light to show that the selected channel is "locked" so that it remains engaged irrespective of accidental touching of the channel select buttons.



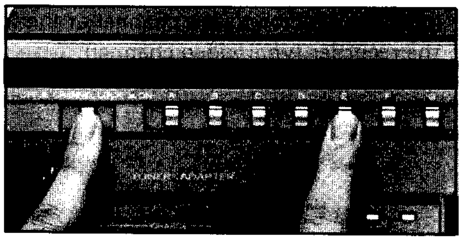
5. Press the REC and PLAY buttons of the recorder simultaneously.
   - Recording of the selected TV programme will start and at the same time the picture will appear on the TV screen.

To record one TV programme while watching another
Set the TU-22EK for recording one TV programme in the same manner described in steps 1 through 5 and set the TV receiver channel selector to any other channel you wish to view.

TIMER RECORDING

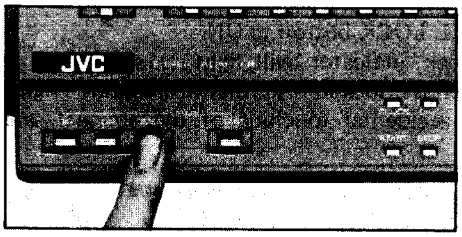
- Connect the HR-2200EK to this unit (TU-22EK). (Refer to page 6 for further reference.)
- Turn the power switches to ON for these units. If unattended recording is to be done and there is no need for monitoring the picture, the TV receiver should remain OFF (if connected).

1. Load a video cassette correctly into the recorder.

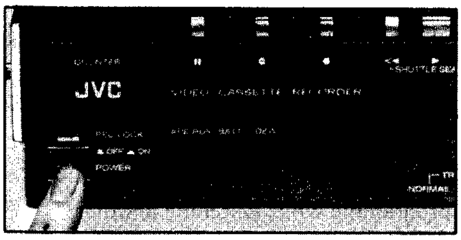


2. Press the channel select button corresponding to the programme you wish to record. Press the CHANNEL LOCK button to ON.
   - The channel lock indicator will light.
   - When the CHANNEL LOCK button is pressed to ON, the selected channel remains engaged irrespective of accidental touching of the channel select buttons.

3. Set the timer as required. (For details, see page 11.)



4. Press the TIMER button of this unit.
   - The power indicator will turn off.
   - The STOP indicator of the recorder will also turn off.
   - If you wish to view TV programmes during timer recording, set the TV receiver channel selector to the channel you wish to watch.



5. Make sure that the POWER button of the HR-2200EK is pressed to ON.
   - When the desired preset time is reached, power will be applied to the recorder and, due to the timer recording start signal supplied from this unit, the recorder will start recording automatically.
   - There is no need to press the REC and PLAY buttons to engage the Record Standby mode.

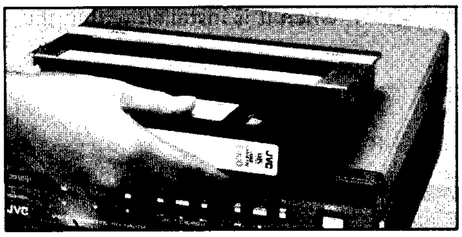
To utilize only the timer switch-off function

- This usage is convenient to stop recording automatically a certain period after you have started recording manually.
- Set the units for timer recording following steps 1 through 5.
- Then press the STOP and START set buttons simultaneously.
- This will start recording immediately. And when the preset switch-off time is reached, the recorder stops automatically.

Notes

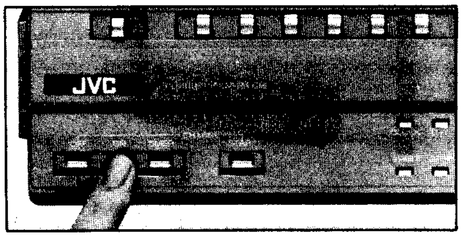
After timer recording	Press the front panel sub-power OFF button of this unit.
If there is a power failure during timer recording	The selected channel will be released and instead a programme corresponding to the A channel will be recorded. The flickering clock dial will indicate the occurrence of a power failure.

PLAYBACK

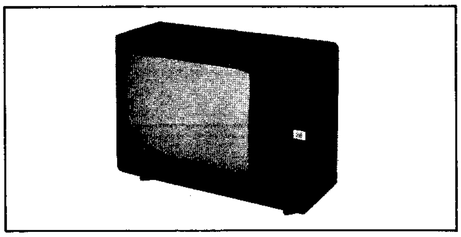


- Connect a TV receiver and the HR-2200EK to this unit (TU-22EK).

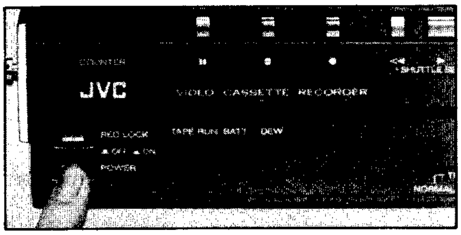
1. Load a pre-recorded cassette into the recorder.



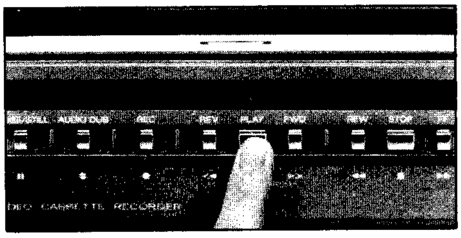
2. Press the sub-power ON button of this unit.



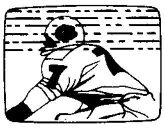
3. Set the TV receiver channel selector to the same channel of the RF converter in the recorder.



4. Press the POWER button of the recorder to ON.



5. Press the PLAY button of the recorder.
   - Playback of the recorded material will start and the picture will appear on the TV screen.



Note

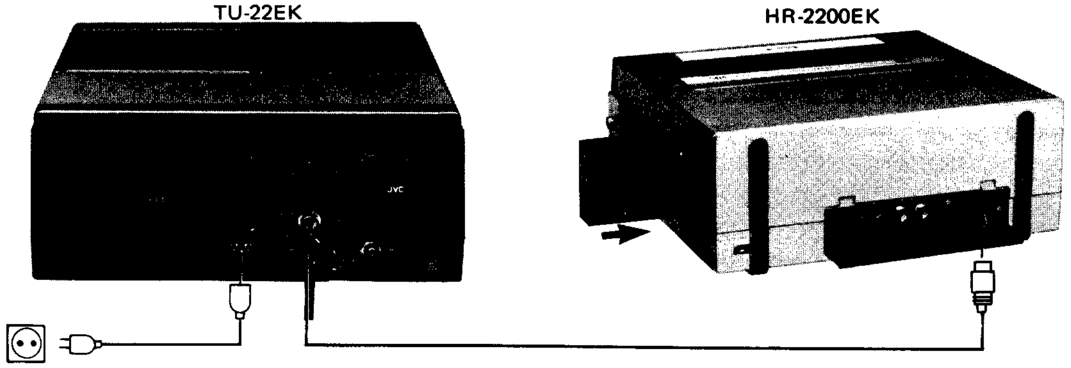
If the playback picture contains noise bars . . .

Is the TRACKING NORMAL control of the recorder properly adjusted? Turn the knob to centre until a click is heard. If noise bars still appear, turn the knob slowly in either direction until they move out of the screen. Recording should always be done with this control returned to centre.

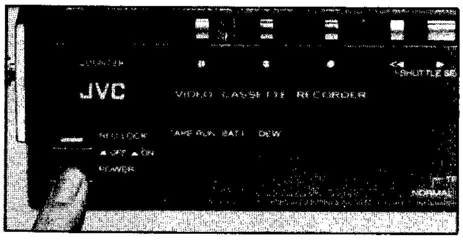
RECHARGING THE BATTERY PACK(NB-P1)

The TU-22EK can serve as a recharging unit for the Ni-Cd battery pack, NB-P1, when it is installed within the HR-2200EK recorder.

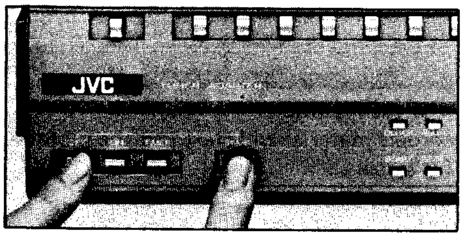
Connections



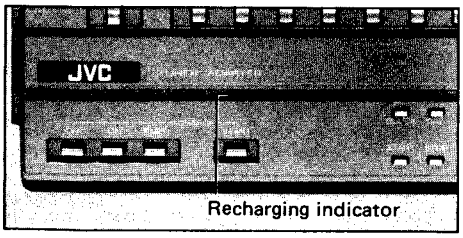
- Install the battery pack NB-P1 into the HR-2200EK.
- Press the front panel sub-power OFF button of the TU-22EK when making this connection.
- While recharging, the recorder cannot be operated.



1. Set the recorder to the Stop mode and the POWER button to OFF.



2. Press the sub-power OFF button of the TU-22EK. Then press the CHARGE START button of the TU-22EK.
   - Recharging will start now with the indicator lighting.



3. Upon completion of recharging, the recharging indicator will go out.

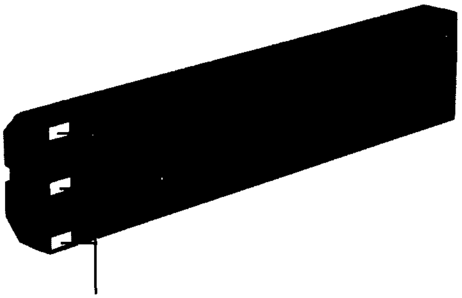
To prevent moisture condensation
The TU-22EK incorporates a power supply for the moisture condensation prevention heater which is built into the HR-2200EK.

- If the POWER button of the HR-2200EK is set to OFF and the sub-power OFF button of the TU-22EK is pressed, the moisture condensation prevention heater inside the HR-2200EK is powered.
  However, if for some reason you are not using the HR-2200EK for a long period of time, it is advisable to remove the power cord of the TU-22EK from the AC outlet.

CAUTIONS REGARDING THE BATTERY PACK AND RECHARGING

The NB-P1 is a nickel-cadmium (Ni-Cd) battery. Give attention to the following to make the most of its characteristics.

- Before use, fully recharge the battery pack.
- Even when you are not using the battery pack, it will gradually discharge of itself. This natural discharging is accelerated as the ambient temperature rises.
  Therefore, it is recommended that you store the battery pack at a place of low temperatures.
- Do not discard the battery pack into a fire nor leave it continuously exposed to high temperatures.
- The battery may not be 100 % rechargeable immediately after its natural discharge, since it has been inactivated. Repeat the recharge/discharge procedures two to three times in such a case, so as to restore the full efficiency of the battery.
- The battery pack has its own service life. If its operating time becomes exceedingly short even though you recharge it correctly, it means that the battery pack is nearing the end of its service life. Replace with a fresh one in such cases.
- Do not disassemble or remodel the battery pack.



- **Do not short-circuit the terminals**
  If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe with a piece of soft cloth.

- The average recharging time takes about 90 minutes per battery pack.

  (The recharging time is based on room temperature of 20°C with a power supply of 240 V. The lower the temperature, the longer the recharging time.)

Temperature ranges of the battery pack:

For recharging:	10°C to 35°C
For operating:	-10°C to 40°C
For storing:	-10°C to 30°C

IN CASE OF DIFFICULTY

Symptoms	Check points
No power is applied to the TU-22EK.	● is the power cord connected? ● Is the rear panel MAINS POWER switch set to ON?
No power is applied to the HR-2200EK.	● Make sure that the output cord of the TU-22EK is connected to the TUNER/AC ADAPTER connector of the HR-2200EK.
Recording is impossible.	● Are all connections made correctly? – See page 6. ● Is the safety tab of the cassette in place? – If not, reseal the slot. ● Is the right procedure being followed? – See page 12.
Timer recording is impossible.	● Has the timer been correctly set? – See page 11. ● Has the right procedure been followed? – See page 13.
Playback is impossible.	● Are all connections made correctly? ● Is the TV receiver channel selector set to the RF converter channel? ● Is the operating procedure accurately followed? See page 14.

SPECIFICATIONS

General

Power requirement	: 110/127/220/240 V∿, 50/60 Hz
Power consumption	: 63 watts
Weight	: 5.0 kg
Dimensions	: 27.4(W) x 10.3(H) x 30.4 (D) cm
Temperature	
Operating	: 0°C to 40°C
Storage	: -20°C to 60°C

Tuner section

Channel coverage	: UHF 21 – 69 (Band IV/V)
RF output	: Direct from the HR-2200EK
Video output	: 1.0 Vp-p, 75 ohms
Audio output	: -14 dBs (open load)

Timer section

Clock/timer indication	: 24-hour fluorescent digital indication
Clock reference	: Power line frequency (50/60 Hz)
Timer start setting	: Within the coming 10 days
Timer stop setting	: Anytime within 24 hours from start time

AC power adapter/charger section

Rated output voltage	: 12 V DC
Rated output current	: Less than 1.8 A (adapter mode)
Battery pack to be charged	: Exclusive Ni-Cd battery pack, NB-P1
Charging indicator	: Provided
Provided accessories	: Cable ass'y Power cord Channel number indication film sheet Spacer x 4

Design and specifications subject to change without notice. E. & O.E.

SECTION 2
DISASSEMBLY

2.1 CHASSIS REMOVAL

1. Take out the two screws ① as shown in Fig. 2-1, then slide the top cover rearward to remove.

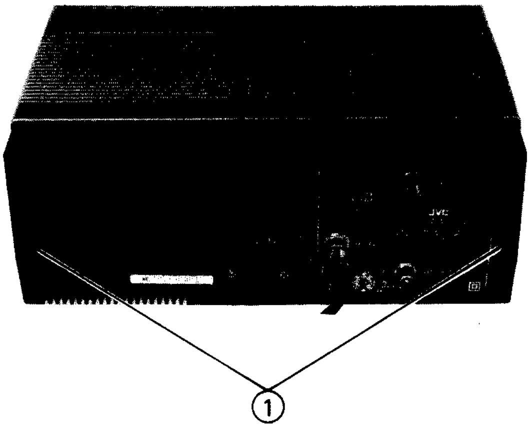


Fig. 2-1

2. Take out the four screws ② of the four feet, then remove the bottom cover.

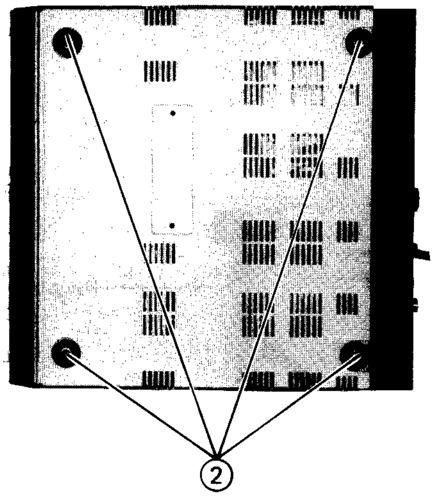


Fig. 2-2

3. Take out the two screws ③ as shown in Fig. 2-3. At the lower edge of the front panel, disengage the two plastic tabs ④ from the metal chassis. Open the front panel outward from the bottom and disengage the plastic tab ⑤ at the top edge.

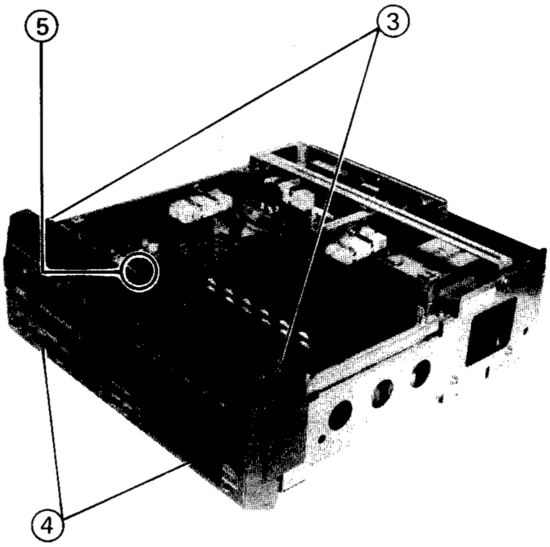
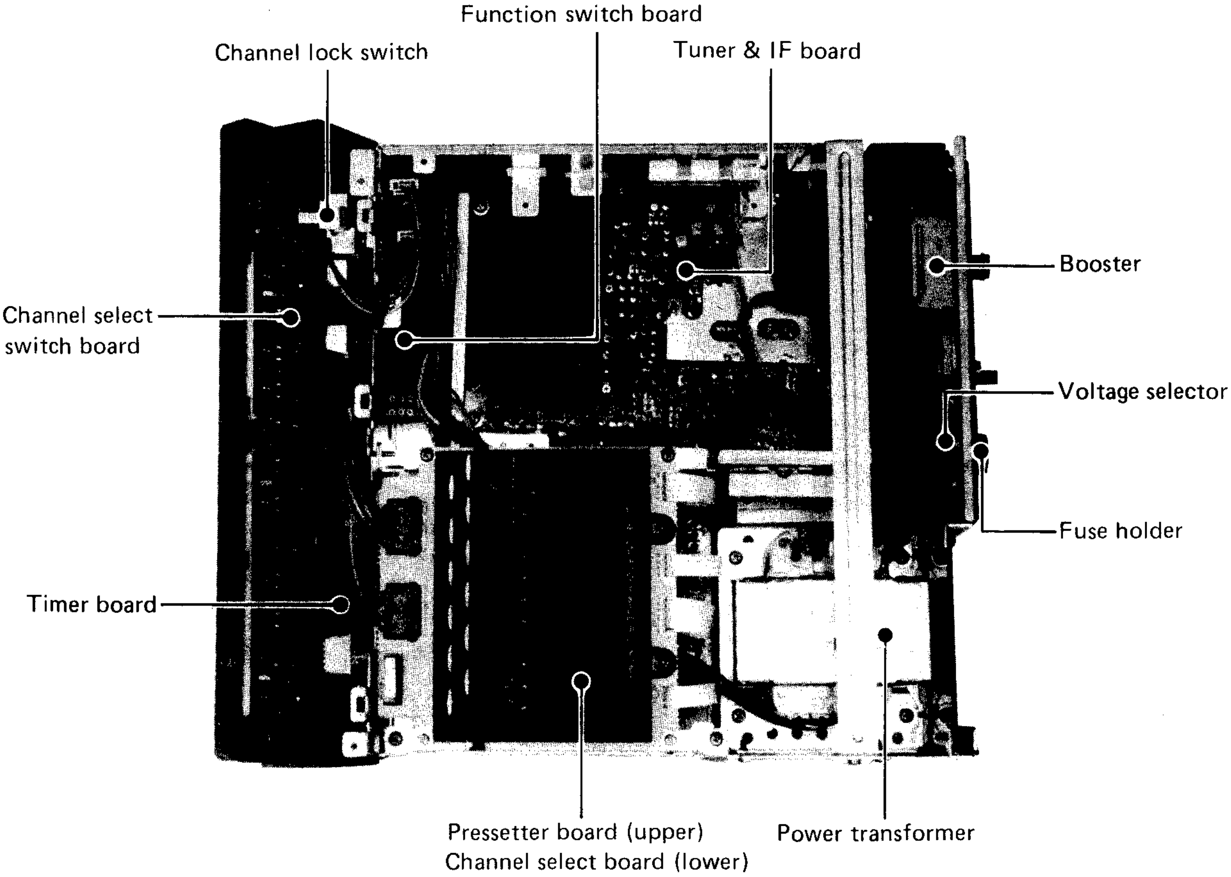
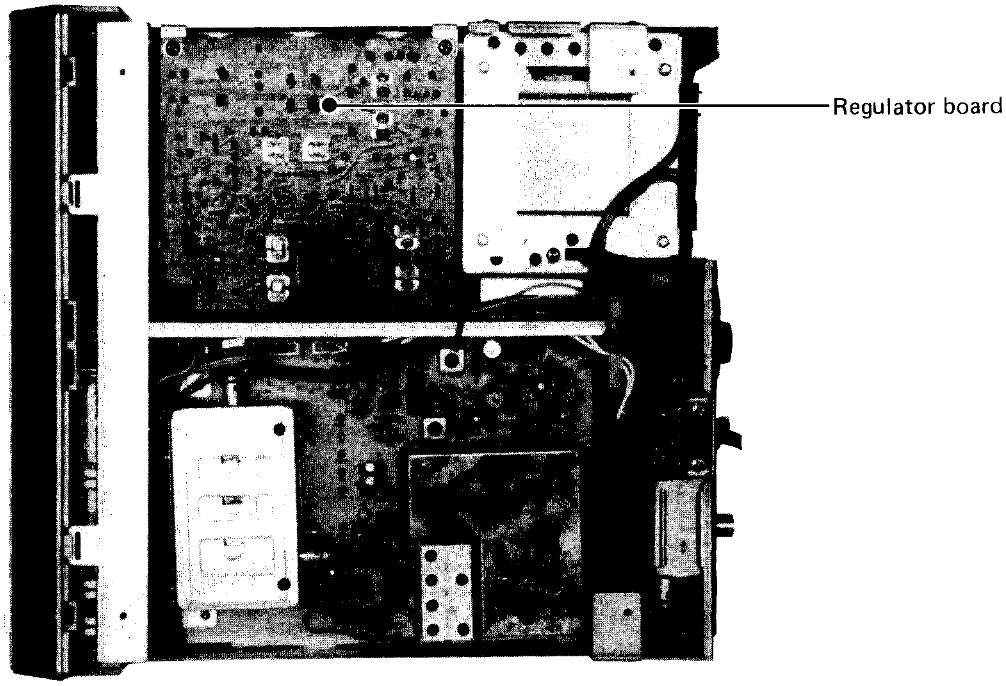


Fig. 2-3

2.2 MAIN PARTS LOCATION


Function switch board
Channel lock switch
Tuner & IF board
Booster
Channel select switch board
Voltage selector
Fuse holder
Timer board
Pressetter board (upper)
Channel select board (lower)
Power transformer

(a) Top view


Regulator board

(b) Bottom view

SECTION 3
ADJUSTMENT PROCEDURE

3.1 REGULATOR CIRCUIT

1. 12 V DC
   (1) Disconnect the 7-pin output connector from the HR-2200E.
   (2) Connect a digital voltmeter or a DC voltmeter to the 6-pin terminal of the 7-pin output connector or terminal 35 of the regulator board.
   (3) Adjust R9 to obtain a DC output voltage of 12.3 ± 0.2 V.
2. AL 12 V DC
   (1) Connect a digital voltmeter or a DC voltmeter to terminal 63.
   (2) Confirm a DC output voltage of 12.0 ± 0.5 V.
3. 10 V DC
   (1) Connect a digital voltmeter or a DC voltmeter to terminal 52.
   (2) Adjust R13 to obtain a DC output voltage of 10.0 ± 0.2 V.
4. 50 V DC
   (1) Connect a digital voltmeter or a DC voltmeter to terminal 72.
   (2) Confirm that the DC output voltage is 50 ± 5 V.
5. Battery charging voltage
   (1) Insert uncharged battery pack NB-P1 into the HR-2200E.
   (2) Turn off the POWER switches of the TU-22E and HR-2200E.
   (3) Connect the 7-pin output cable to the HR-2200E.
   (4) Connect a digital voltmeter or a DC voltmeter to terminal 32.
   (5) Press the CHARGE START switch of the TU-22E.
   (6) Confirm that the DC output voltage is more than 16 V.
   (7) At this time, check that the recharging indicator of the TU-22E lights.
6. Others

   Observe that R101 to R103 of $\boxed{1}\boxed{0}$ circuit board are not in contact with one another.

3.2 PRESETTER CIRCUIT

1. VHF-I/VHF-III/UHF change-over switch (EG only)
   (1) Connect the antenna cable from the antenna.
   (2) Confirm reception of each channel, A to L, of the VHF-I, VHF-III and UHF bands.
2. Coarse tuning indicator
   (1) Receive the television signal.
   (2) The channel indicating position of the indicator should roughly agree with the channel under actual reception.

3.3 CHANNEL SELECT CIRCUIT

1. BM voltage
   (1) Connect a digital voltmeter or a DC voltmeter with the tuner BM terminal of the TU & IF board.
   (2) Adjust R10 of the channel select board to obtain a DC voltage of 15 ± 0.1 V.
2. Operation check
   (1) Turn off the channel lock switch.
   (2) Confirm that both picture and sound of a newly selected channel are obtained immediately after selection.
   (3) At the same time, observe that the LED of the pressed channel lights.

3.4 TU & IF CIRCUIT

1. NOISE VR

   Adjust the NOISE VR to correct for excess noise in the picture or when streaky cross interference due to strong electric fields.
   (1) Adjust R7 (NOISE) to minimize noise or streaks.
   (2) Check for absence of abnormality on all channels.
2. Sound trap
   (1) Receive a color broadcast in which there is little motion and variations in color (such as a musical show). Colors should be as dense as possible and sound nearly continuous.
   (2) Turn the core of trap transformer (T4) slowly to adjust it to a position at which no voice beat (streak) appears.

3.5 TIMER

1. Power failure indicator

   When the power cord is connected to an AC outlet and the main power switch turned on, the entire timer indicating section should flash.

2. Clock setting

   (1) Press the CLOCK button and 0:00 becomes displayed. At this time, press HOUR/SERIAL and MIN/DAY buttons to advance the display. Hold the buttons depressed for continuous advance. During setting, the minutes do not increment the hours. For example, the next indication after 1:59 is 1:00, and not 2:00.

   (2) When the CLOCK button is released, the seconds indicator begins to flash.

3. Day setting

   (1) Hold the DAY button depressed and press the MIN/DAY button to set the desired recording day.

   (2) The indication increments from 0 to 9, then returns to 0. 0 indicates today, 1 tomorrow, and so on up to 9. Hold the buttons depressed for continuous advance.

4. Repeat mode

   (1) Hold the DAY button depressed and press the HOUR/SERIAL button. The small letter "d" appears in the indication.

   (2) When the HOUR/SERIAL button is pressed again, the d display extinguishes. So long as the d display appears, recording is performed daily starting with the selected day and at the time set by START.

5. Recording start time

   (1) The desired recording start time is set by holding the START button depressed and operating the HOUR/SERIAL and MIN/DAY buttons.

   (2) The time indication should operate in the same manner as in above item 2 (clock setting).

6. Recording end

   (1) The recording end time is set by holding the STOP button (of the timer section) depressed and operating the HOUR/SERIAL and MIN/DAY buttons.

   (2) The time indication should operate in the same manner as in above item 2 (clock setting).

7. Timer operation (1)

   Set the clock to 23:59, the day to 1, the recording start time to 0:00 and the recording end time to 0:01, then press the TIMER switch to check actual timer operation. However, actual recording is started 10 seconds before the set time.

8. Manual recording start

   When timer recording has been set up, but before the start time is reached, simultaneously pressing the START and STOP buttons initiates recording. In this case, the day indication becomes 0.

9. Timer operation (2)

   The timer should not operate in the following cases:

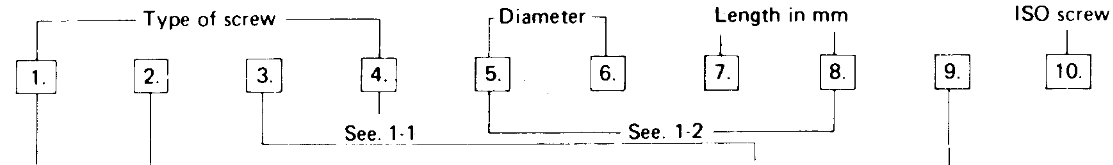
   (1) When the TIMER switch is not pressed.

   (2) If recording start and recording end are set to the same time.

   (3) The operating mode does not change when the settings of the clock, recording start and end times are being altered. For example, when the start time is being set and the display passes the clock "real time", recording does not start.

SECTION 4
EXPLODED VIEWS AND PARTS LIST

IMPORTANT SAFETY NOTICE
Parts identified by the ⚠ symbol are critical for safety.
Replace only with specified part numbers.



Type of screw

S	Normal screw
N	Assembly screw
L	"
D	"
G	"
M	W. Wood screw
F	Feather screw
T	Setscrew
Y	"
B	Bolt
N	Nut
W	Washer
R	E-ring
E	–
P	Spring

Shape of head

P		Pan head
S		Flat countersunk head
H		Oval countersunk head
D		Binding head
R		Round head
B		Round head
T		Truss head

Material

Symbol letter	Material
S	Steel
E	Stainless steel
C	Cast iron
U	Bronze
B	Brass
P	Phosphor bronze
N	German silver
Y	Brass
A	Aluminum
Z	Zinc-alloy
K	Polycarbonate

Type of screw

P	Cross-Recessed head screw
A	Tapping screw
B	Tapping screw
T	Tapping screw
E	Tapping screw

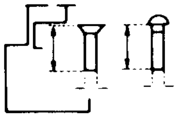
Surface treatment

Symbol letter	Surface treatment
Z	Galvanization, dichromic acid treatment (MFZn2-C)
N	Nickel plating (MFNi2, MFNi1)
R	Chrome plating (MBCr2, MBCr1)
G	Silver plating (SP4)
W	Nichrome platings
P	Phosphite treatment
B	Bronze plating
M	Black coloring after galvanization
A	Red coloring after galvanization
C	Blue coloring after galvanization
T	Green coloring after galvanization
V	Violet coloring after galvanization
F	Iron with black coloring

Diameter and Length of screw

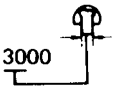
– Example –

SPBP3010ZS



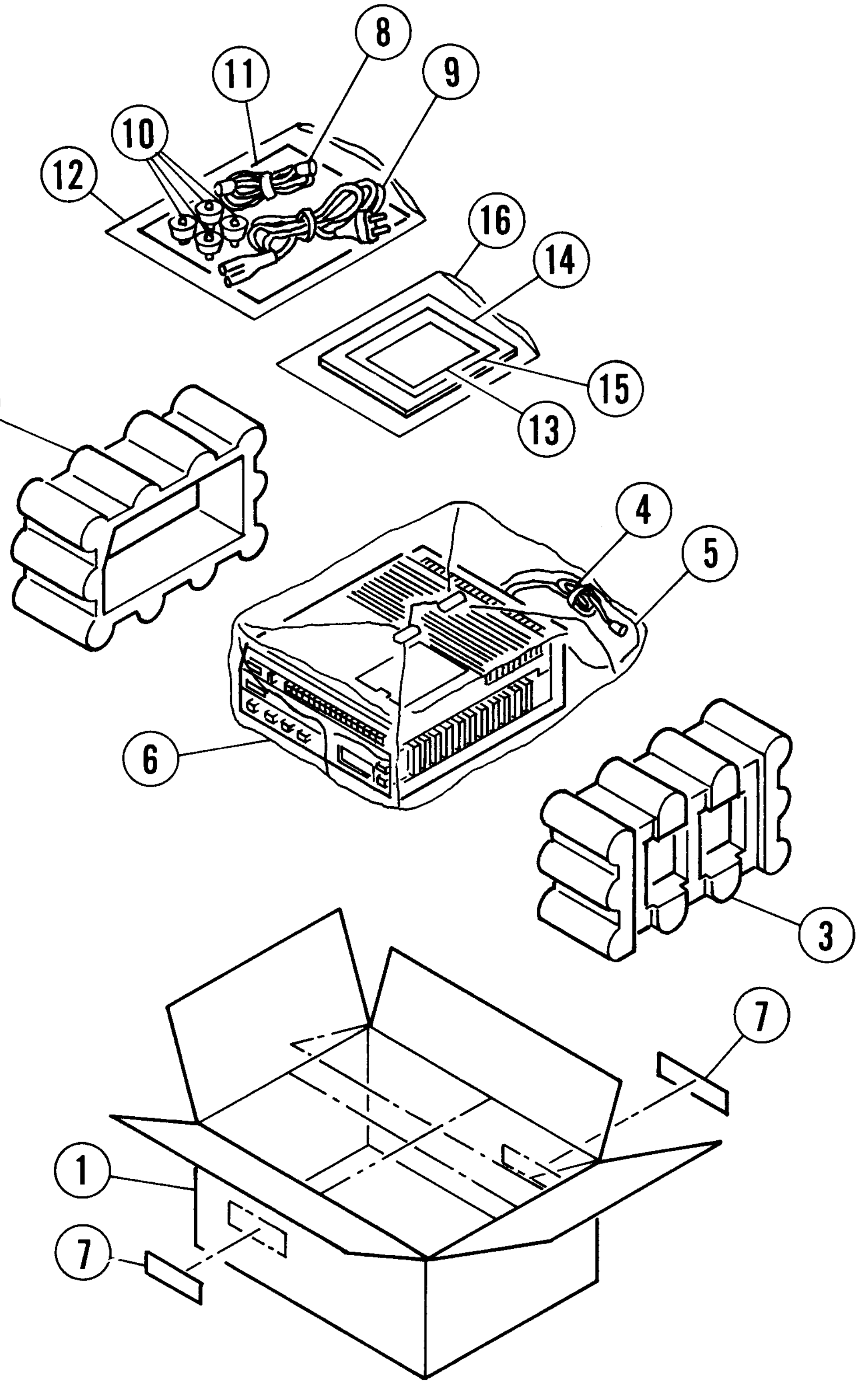
(Diameter x 10)

E-ring Washer



REE3000 WNS3000N

4.1 PACKING ASSEMBLY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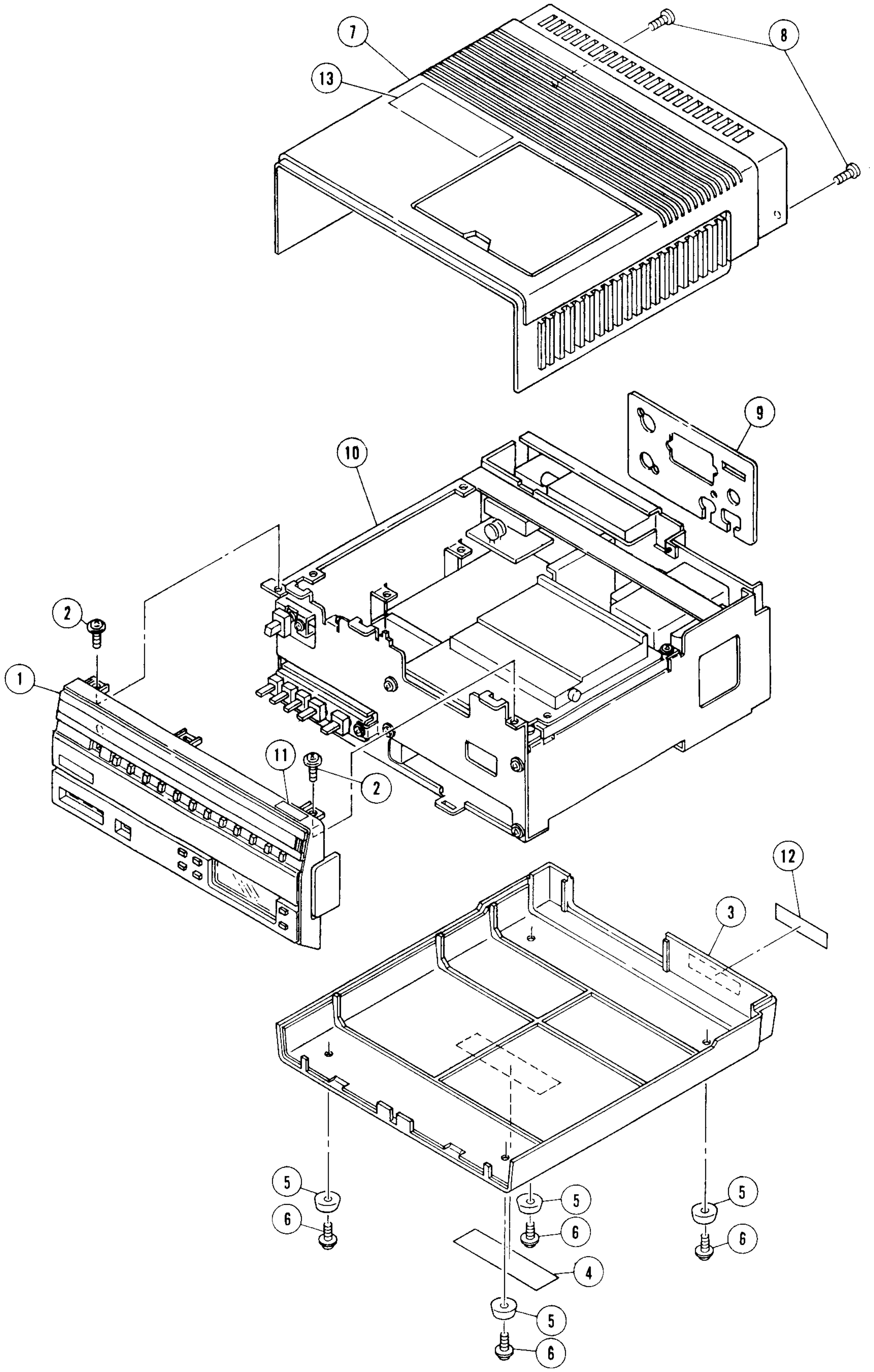
Symbol No.	Part No.	Part Name	Description	Q'ty
	PUP30460C	Packing Case Ass'y	EK Incl. (1) – (3)	1
	″ D	″	EG Incl. (1) – (3)	1
1	PUP30460-5	Packing Case	EK	1
	″ -6	″	EG	1
2	PUP10102	Left Cushion		1
3	PUP10103	Right Cushion		1
4	PU41523-4	Band		1
5	QPGA017-02505	Poly Bag		1
6	PUP40324-6	″		1
7	PUP40329	Serial No. Sticker		2
8	⚠ PU43294G	Aerial Cable		1
9	⚠ QMP3950-183V	Power Cord	EG	1
	PU46128-BS	″	EK	1
10	PU47850	Spacer		4
11	PUP40543-2	Sheet		1
12	QPGB017-02404	Poly Bag		1
13	A27507A	Channel Film		1
14	PU30425-343	Instruction Book	EG	1
	″ -342	″	EK	1
15	PU32004	Guarantee Card	EK only	1
16	QPGA020-03005	Poly Bag		1

4.2 CABINET ASSEMBLY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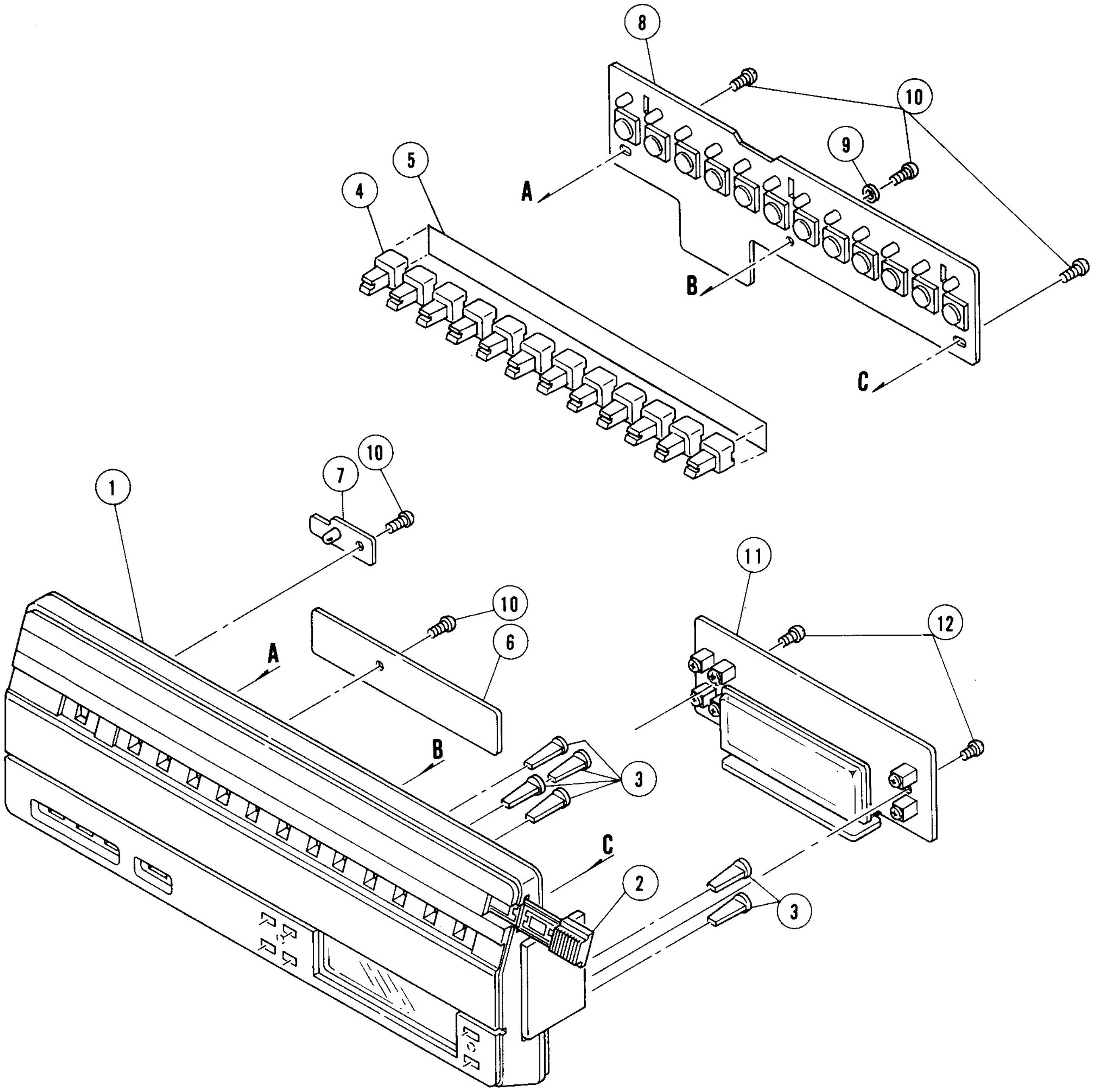
Symbol No.	Part No.	Part Name	Description	Q'ty
1	–	Front Cover Ass'y	See Sec. 4.3.	1
2	GBST3008ZS	Tapping Screw		2
3	PU10280-2	Bottom Cover		1
4	PU50321	Caution Label		1
5	PU49205	Foot		4
6	GPST3008ZS	Tapping Screw		4
7	PU10284B	Top Cover Ass'y		1
8	SDST3008MS	Tapping Screw		2
9	PU32645	Rear Panel	EK	1
	PU32645-2	"	EG	1
10	–	Chassis Ass'y	See Sec. 4.4.	1
11	PU49765	Sticker	CAUTION EK only	1
12	PU47062	Serial No. Label		1
13	PU50311	Caution Sticker	EK	1
	PU50324	"	EG	1

4.3 FRONT COVER ASSEMBLY



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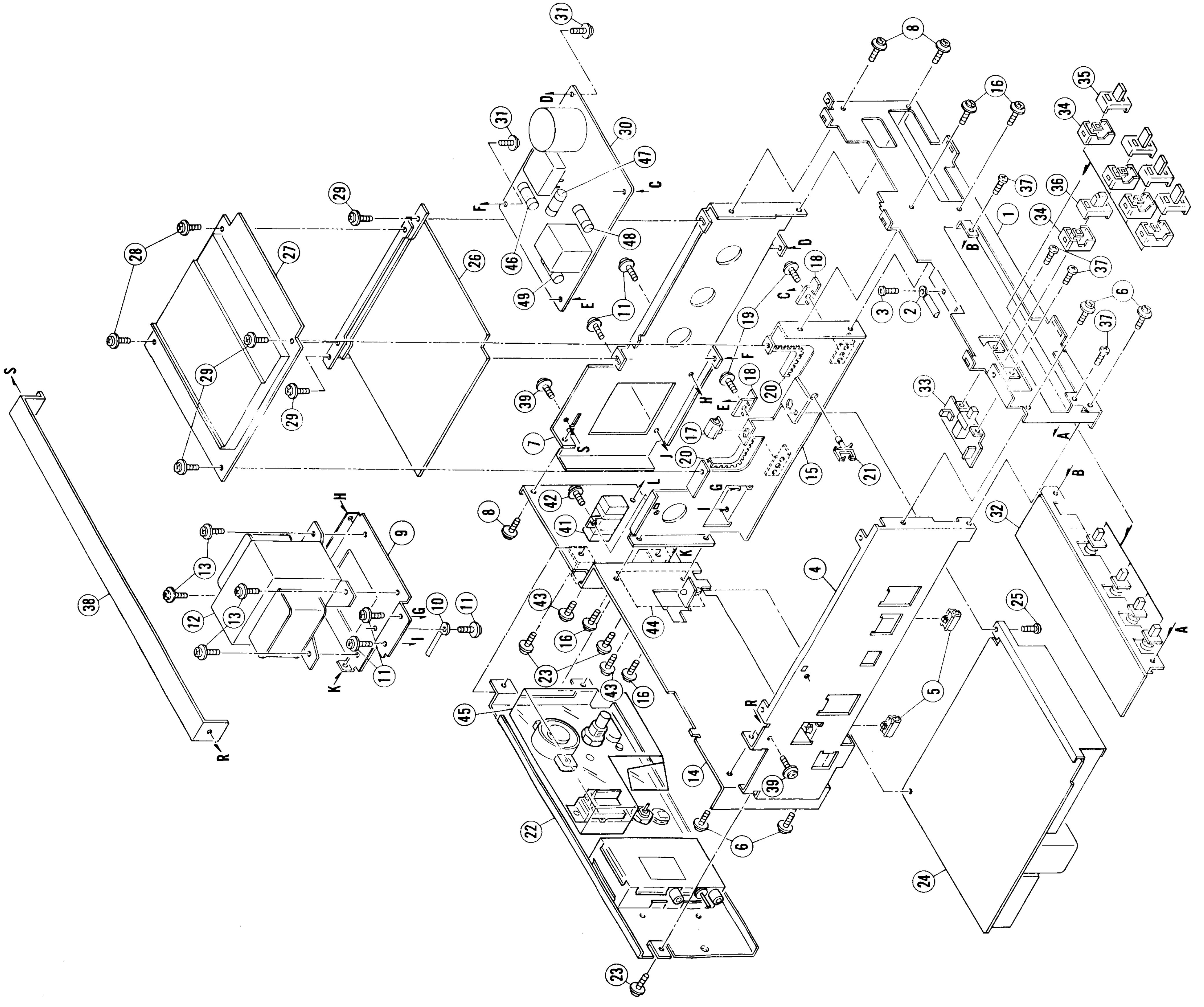
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU10311A	Front Cover Ass'y	Incl. (2)	1
2	PU32545A	Channel Film Holder Ass'y		1
3	PU49329	Timer Button		6
4	PU49330	Channel Select Button		12
5	PU50030	Spacer		1
6	–	Function LED Board Ass'y	See Sec. 6.4.	1
7	–	Channel Lock LED Board Ass'y	See Sec. 6.5.	1
8	–	Channel Select Switch Board Ass'y	See Sec. 6.6.	1
9	Q03095-206	Washer		1
10	SBSF3008Z	Tapping Screw		5
11	–	Timer Board Ass'y		1
12	SBSF3008Z	Tapping Screw		2

4.4 CHASSIS ASSEMBLY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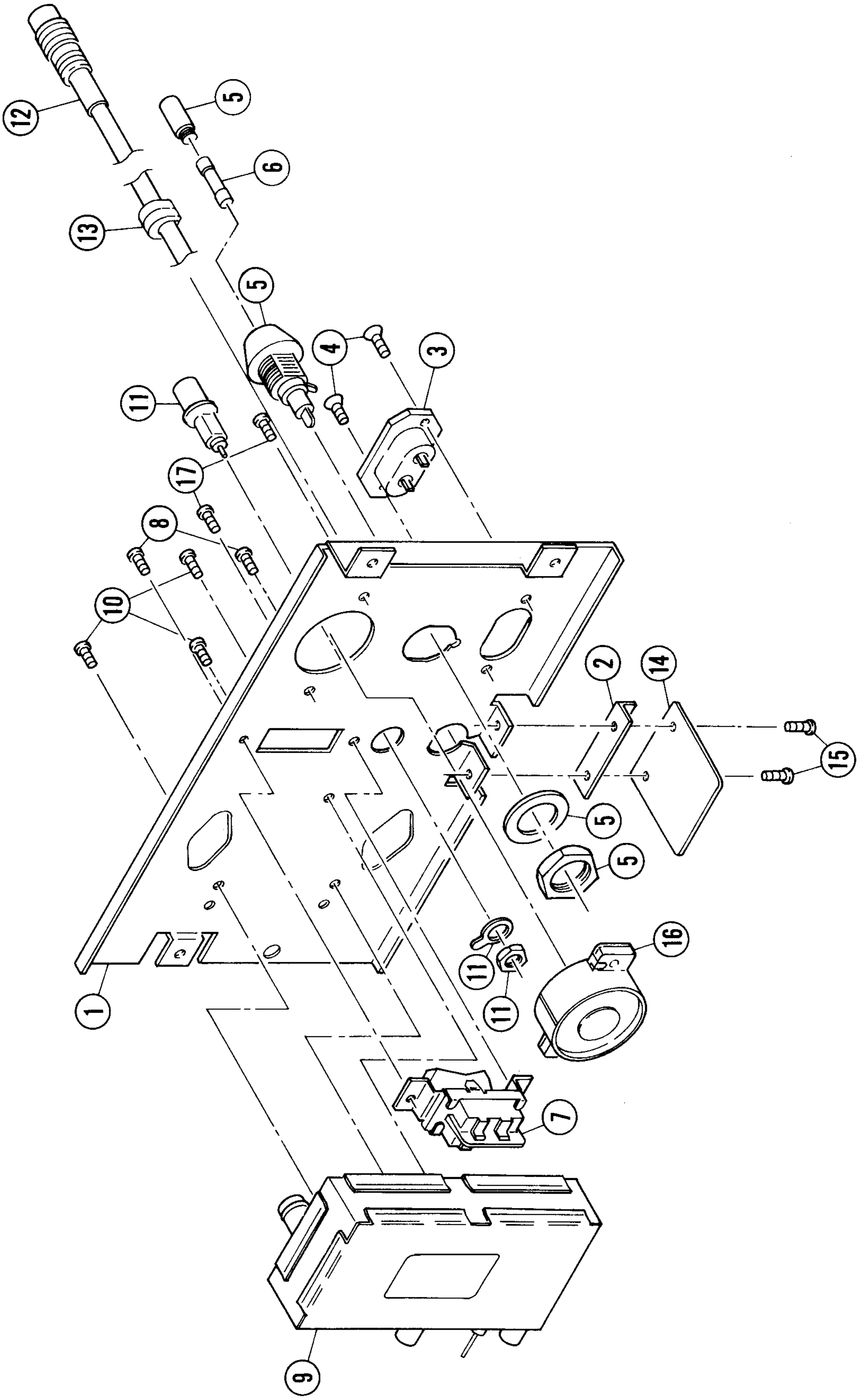
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU20967	Front Bracket		1
2	PUS45919	Wire Clamp (A)		1
3	SBST3006ZS	Tapping Screw		1
4	PU20968	Side Bracket (L)		1
5	PU47876	Circuit Board Support		2
6	GBST3008ZS	Tapping Screw		4
7	PU20969	Side Bracket (R)		1
8	GBST3008ZS	Tapping Screw		3
9	PU32538	Transformer Bracket		1
10	PUS45919	Wire Clamp (A)		1
11	GBST3008ZS	Tapping Screw		5
12	⚠ PU49141-003-BS	Power Transformer		1
13	DPSP4008ZS	Screw		4
14	–	Heat Sink Ass'y	See Sec. 4.6.	1
15	PU20970-1-5	Center Bracket		1
16	GBST3008ZS	Tapping Screw		4
17	PU47876	Circuit Board Support		1
18	PU31671	Hinge		2
19	GBST3008ZS	Tapping Screw		2
20	PU43172-9-48	Edge Cover		2
21	PU49674	Wire Clamp		1
22	–	Connector Ass'y	See Sec. 4.5.	1
23	GBST3006ZS	Tapping Screw		3
24	–	Tuner & IF Circuit Board Ass'y	See Sec. 6.10.	1
25	SBST3006ZS	Tapping Screw		1
26	–	Channel Select Circuit Board Ass'y	See Sec. 6.9.	1
27	–	Presetter Circuit Board Ass'y	See Sec. 6.8.	1
28	DPSP3006ZS	Screw		2
29	GBST3006ZS	Tapping Screw		4
30	–	Regulator Circuit Board Ass'y	See Sec. 6.1.	1
31	GBST3006ZS	Tapping Screw		2
32	–	Function Switch Ass'y	See Sec. 6.2.	1
33	–	Channel Lock Switch Ass'y	See Sec. 6.3.	1
34	PU49202	Flexible Ring		5
35	PU49180	Push Button		4
36	PU49179	Push Button		1
37	SBST3006ZS	Tapping Screw		3
38	PU32712	Stay		1
39	GBST3006ZS	Tapping Screw		2
40	–	–		–
41	QRF109J-122	Unflammable Resistor		1
42	GBST3006ZS	Tapping Screw		1
43	″	″		2
44	PU50047	Sheet		1
45	⚠ PU32789	Barrier		1
46	⚠ QMF51A2-5R0-BS	Fuse	F2	1
47	⚠ ″ -4R0-BS	″	F3	1
48	⚠ ″ -R50-BS	″	F4	1
49	⚠ ″ -R50-BS	″	F5	1

4.5 CONNECTOR ASSEMBLY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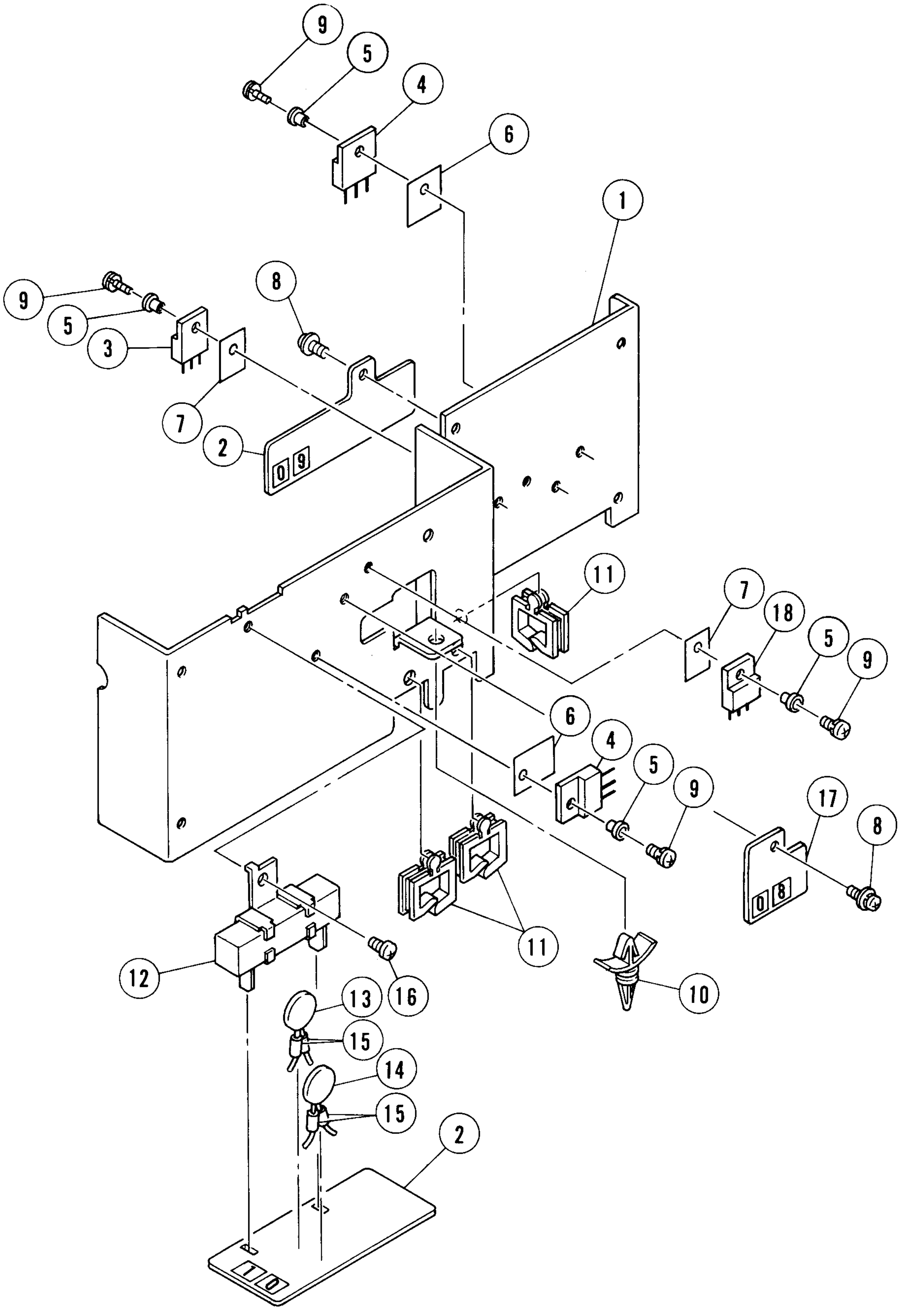
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU32651	Terminal Bracket		1
2	PU50248	Stay		1
3	⚠QMC9017-001-BS	AC Socket Ass'y		1
4	⚠SSST3006MS	Tapping Screw		2
5	⚠QMG0301-003-BS	Fuse Holder		1
6	⚠QMF51A2-1R0-BS	Fuse	F1	1
7	⚠QSE2135-006-BS	Seesaw Switch	S1	1
8	SPST3005MS	Tapping Screw		2
9	PU49720	Booster	(EG)	1
	PU49721	"	(EK)	1
10	SPST3005MS	Tapping Screw		3
11	PU49932	Aerial Connector		1
12	PU49252A	DC Cord Ass'y		1
13	QHS6374-162	Stopper		1
14	PU49931	Connector Board		1
15	SXST3006ZS	Tapping Screw		2
16	⚠QSR0085-002-BS	Voltage Selector		1
17	SPST3006MS	Tapping Screw		2

4.6 HEAT SINK ASSEMBLY PARTS LIST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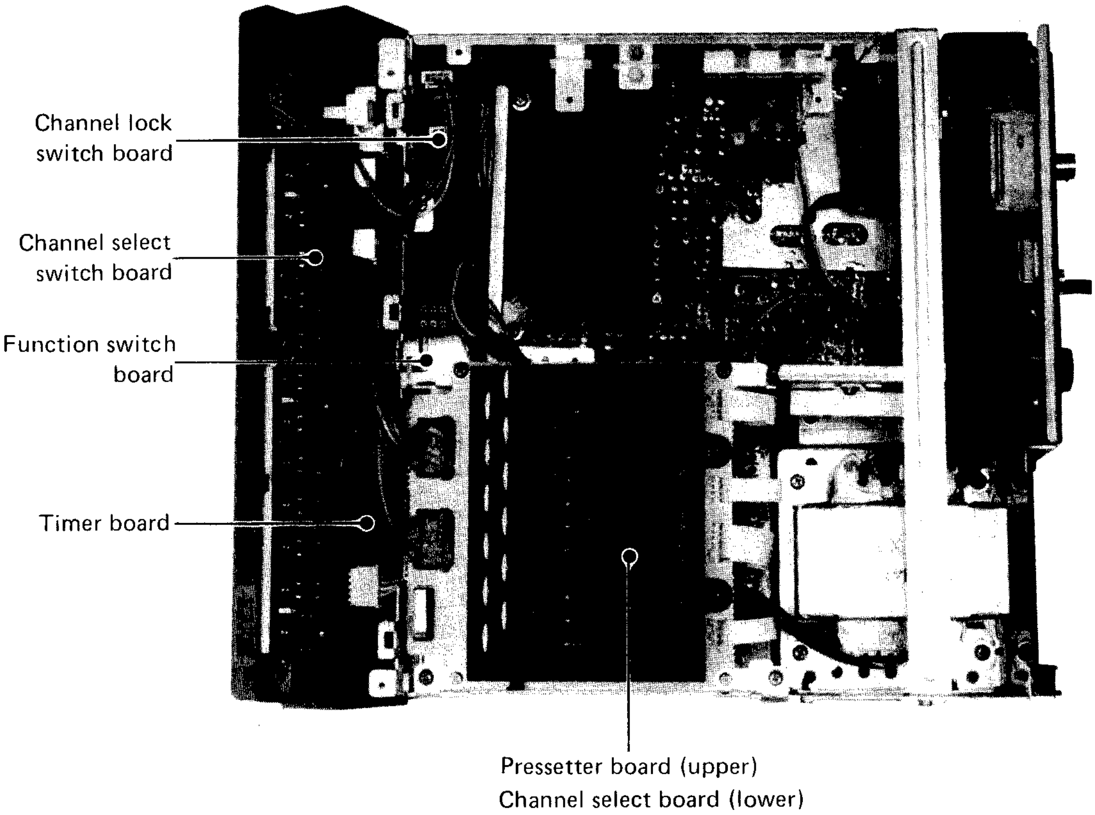
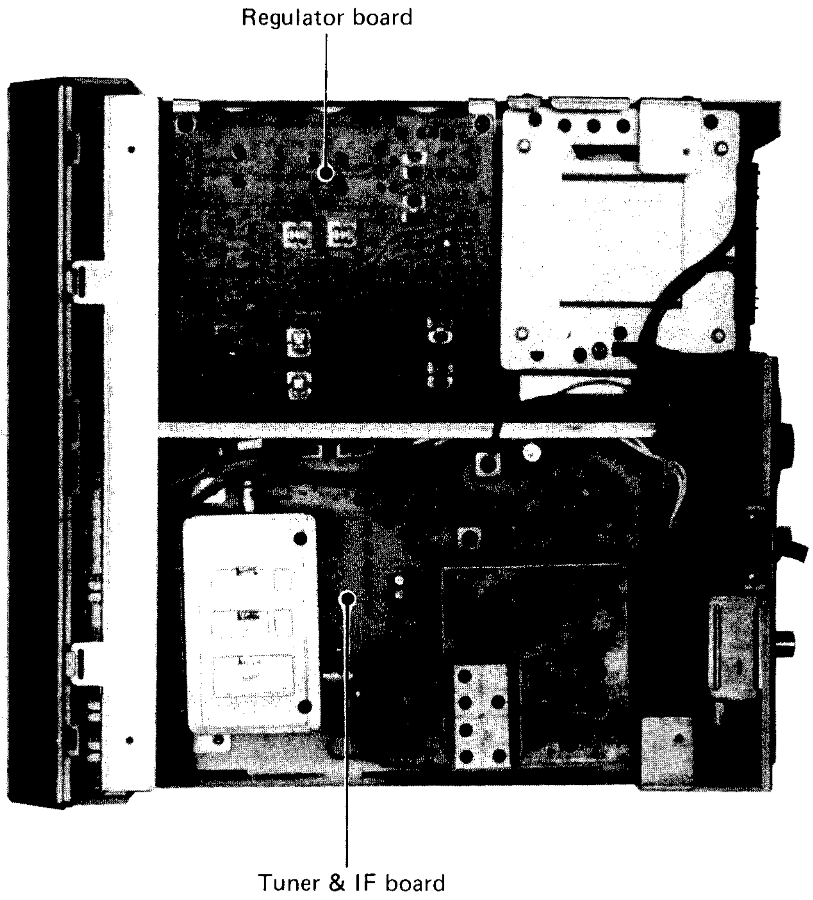
Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU20971	Heat Sink		1
2	PU32598	Power Sub Circuit Board	$\boxed{0}\boxed{9}$, $\boxed{1}\boxed{0}$	1
3	2SD389A-O	Transistor	X103	1
4	2SC2484P	"	X101, X102	2
5	PU41624-6	Insulation Washer		4
6	PU45375-4	Spacer		2
7	PU45375	"		2
8	DPSP3006ZS	Screw		2
9	LPSP3006ZS	"		4
10	PU43146	LCB Support		1
11	PU46775	Edge Cover		3
12	PU49350-3R3	Unflammable Resistor	R101	1
13	PU49254-2R2	Posistor	R102	1
14	" -3R3	"	R103	1
15	PU43092	Collar	for (13) and (14)	4
16	SBST3006ZS	Tapping Screw		1
17	PU50003	Transistor Circuit Board		1
18	2SC1983R	Transistor	X001	1

SECTION 5
CHARTS AND DIAGRAMS

5.1 ELECTRICAL PARTS LOCATION

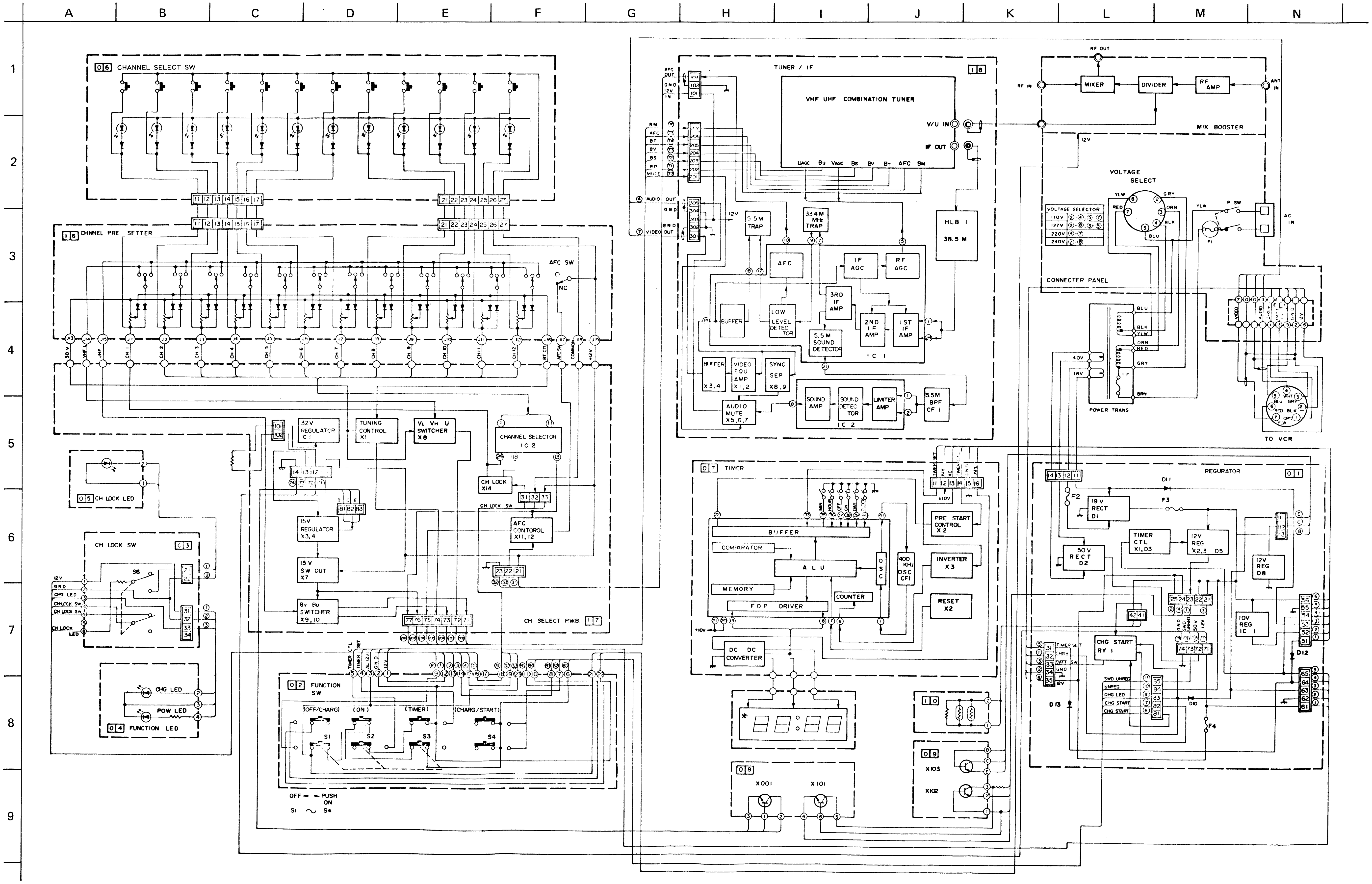

Channel lock switch board
Channel select switch board
Function switch board
Timer board
Pressetter board (upper)
Channel select board (lower)

(a) Top view


Regulator board
Tuner & IF board

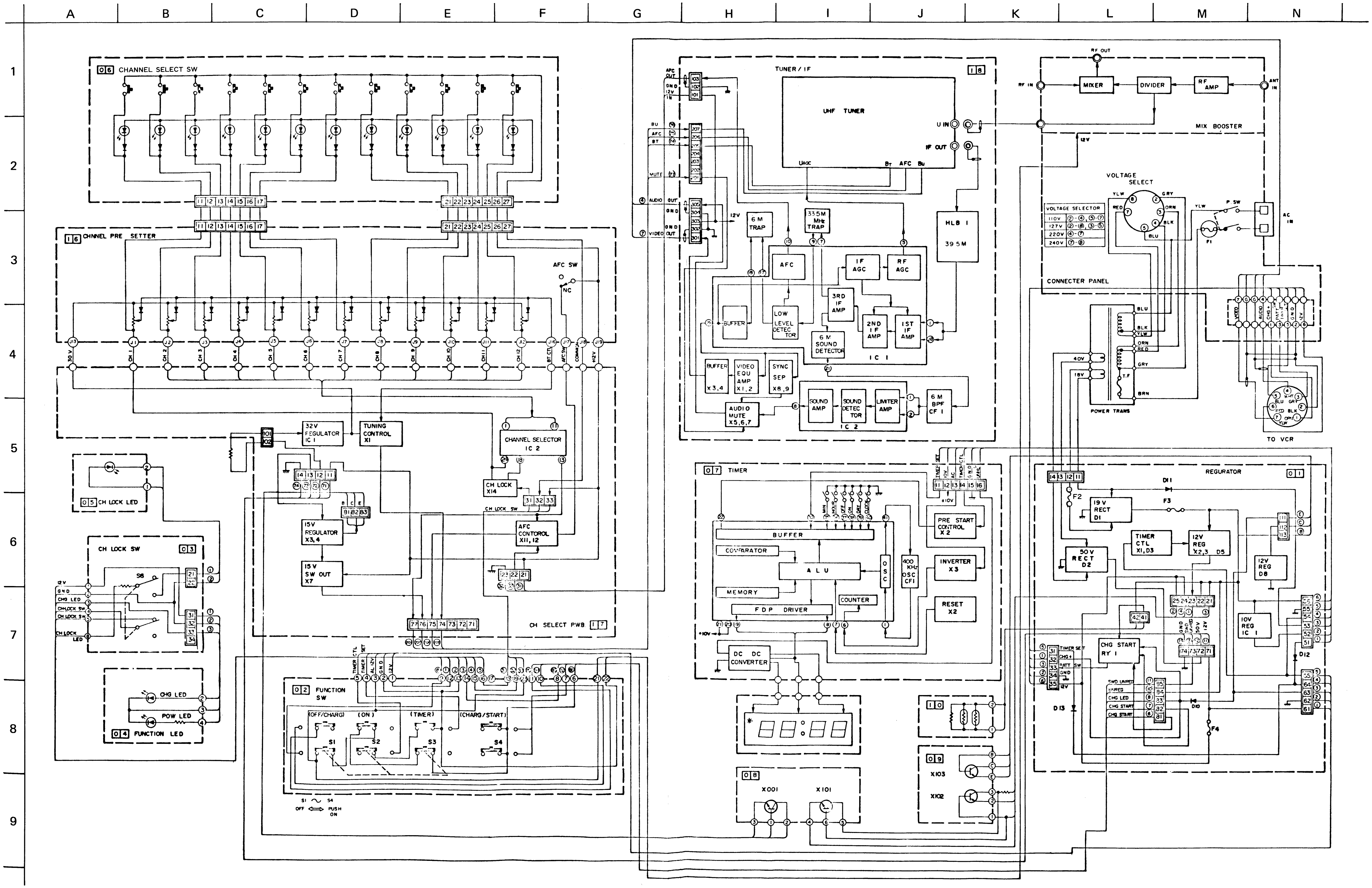
(b) Bottom view

5.2 OVERALL WIRING-1 (EG)



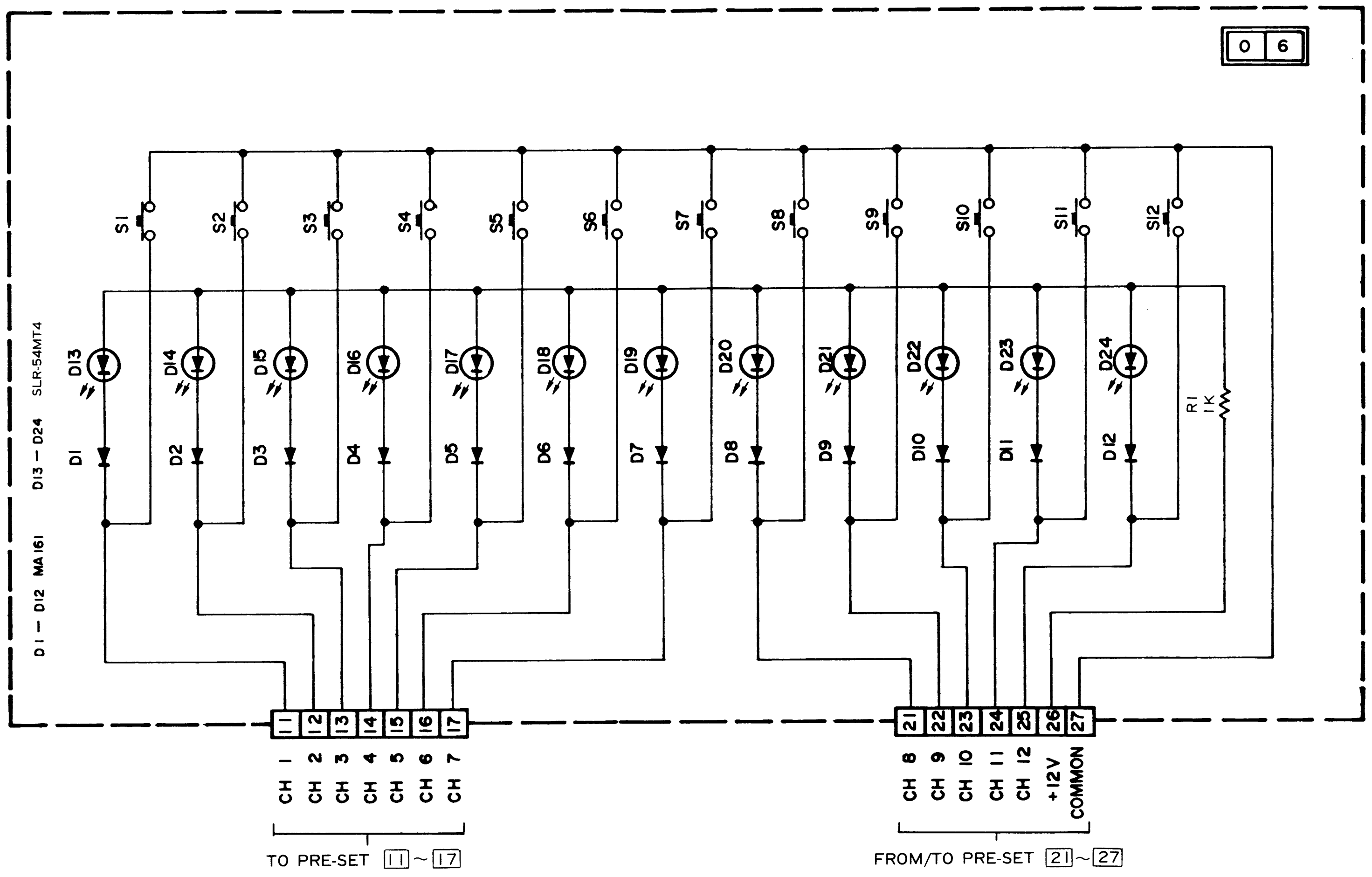
A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
06 CHANNEL SELECT SW
16 CHNNEL PRE SETTER
AFC SW
NC
30 V
VHF
UHF
CH 1
CH 2
CH 3
CH 4
CH 5
CH 6
CH 7
CH 8
CH 9
CH 10
CH 11
CH 12
BT CTL
AFC SW
COMMON
12V
05 CH LOCK LED
CH LOCK SW
C3
S6
12V
GND
CHG LED
CH LOCK SW
CH LOCK LED
04 FUNCTION LED
CHG LED
POW LED
32V REGULATOR IC 1
TUNING CONTROL X1
VL VH U SWITCHER X8
CHANNEL SELECTOR IC 2
CH LOCK X14
CH LOCK SW
AFC CONTOROL X11, 12
15V REGULATOR X3, 4
15 V SW OUT X7
8V BU SWITCHER X9, 10
CH SELECT PWB 17
02 FUNCTION SW
(OFF/CHARG)
(ON)
(TIMER)
(CHARG/START)
S1
S2
S3
S4
OFF ←→ PUSH ON
S1 ∼ S4
TIMER CTL
TIMER SET
GND
12V
TUNER / IF
18
AFC OUT
GND
12V IN
BM
AFC
BT
BV
BS
BU
MUTE
AUDIO OUT
GND
VIDEO OUT
VHF UHF COMBINATION TUNER
V/U IN
IF OUT
UAGC
BU
VAGC
BS
BV
BT
AFC
BM
5.5M TRAP
33.4M MHz TRAP
HLB 1
38.5 M
AFC
IF AGC
RF AGC
3RD IF AMP
BUFFER
LOW LEVEL DETEC TOR
5.5 M SOUND DETECTOR
2ND IF AMP
1ST IF AMP
IC 1
BUFFER X3,4
VIDEO EQU AMP X1, 2
SYNC SEP X8, 9
AUDIO MUTE X5,6,7
SOUND AMP
SOUND DETEC TOR
LIMITER AMP
IC 2
5.5M BPF CF 1
RF OUT
RF IN
MIXER
DIVIDER
RF AMP
ANT IN
MIX BOOSTER
12V
VOLTAGE SELECT
YLW
GRY
RED
ORN
BLK
BLU
P SW
AC IN
F1
VOLTAGE SELECTOR
110V
127V
220V
240V
CONNECTER PANEL
BLU
BLK
YLW
ORN
RED
GRY
BRN
40V
18V
T F
POWER TRANS
VIDEO
AUDIO
TO VCR
07 TIMER
+10V
BUFFER
COMPARATOR
A L U
MEMORY
FDP DRIVER
COUNTER
O S C
400 KHz OSC CF1
PRE START CONTROL X2
INVERTER X3
RESET X2
DC DC CONVERTER
08
X001
X101
10
09
X103
X102
REGURATOR
01
F2
D11
F3
19V RECT D1
TIMER CTL X1, D3
12V REG X2, 3 D5
50V RECT D2
12V REG D8
10V REG IC 1
CHG START RY 1
TIMER SET
CHG
BATT SW
GND
12V
SWD UNREG
UNREG
CHG LED
CHG START
D13
D10
D12
F4
GND
SWD
UNREG
50V
12V

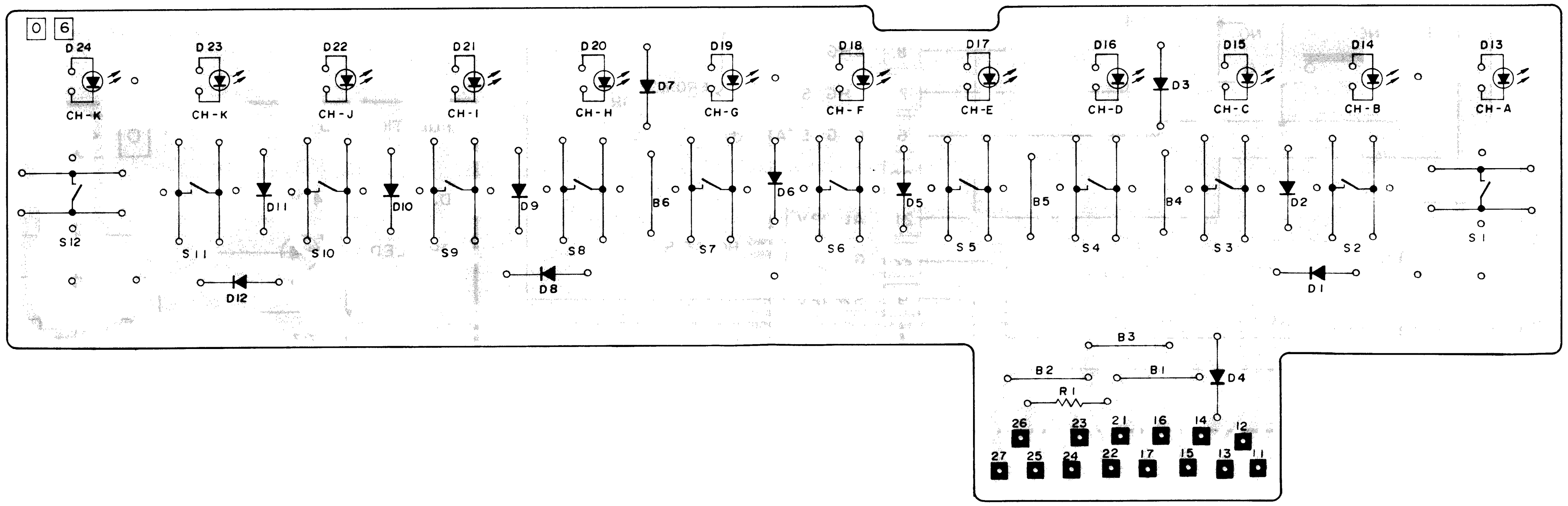
5.3 OVERALL WIRING-2 (EK)



A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
06 CHANNEL SELECT SW
16 CHNNEL PRE SETTER
AFC SW
NC
30 V
CH 1
CH 2
CH 3
CH 4
CH 5
CH 6
CH 7
CH 8
CH 9
CH 10
CH 11
CH 12
BT CTL
AFC SW
COMMON
12V
32V REGULATOR IC 1
TUNING CONTROL X1
CHANNEL SELECTOR IC 2
CH LOCK X14
CH LOCK SW
15V REGULATOR X3,4
15V SW OUT X7
AFC CONTOROL X11, 12
CH SELECT PWB 17
05 CH LOCK LED
CH LOCK SW 03
S6
12V
GND
CHG LED
CH LOCK SW
CH LOCK SW
CH LOCK LED
CHG LED
POW LED
04 FUNCTION LED
TIMER CTL
TIMER SET
ALL 12V
GND
12V
02 FUNCTION SW
(OFF/CHARG)
(ON)
(TIMER)
(CHARG/START)
S1
S2
S3
S4
S1 ~ S4
OFF ⟺ PUSH ON
TUNER / IF
18
AFC OUT
GND
12V IN
BU
AFC
BT
MUTE
AUDIO OUT
GND
GND
VIDEO OUT
UHF TUNER
U IN
IF OUT
UAGC
BT
AFC
BU
12V
6M TRAP
33.5M MHz TRAP
HLB 1 39.5M
AFC
IF AGC
RF AGC
3RD IF AMP
BUFFER
LOW LEVEL DETEC TOR
2ND IF AMP
1ST IF AMP
6M SOUND DETECTOR
IC 1
BUFFER X3,4
VIDEO EQU AMP X1,2
SYNC SEP X8,9
AUDIO MUTE X5,6,7
SOUND AMP
SOUND DETEC TOR
LIMITER AMP
6M BPF CF 1
IC 2
RF OUT
RF IN
MIXER
DIVIDER
RF AMP
ANT IN
MIX BOOSTER
12V
VOLTAGE SELECT
VOLTAGE SELECTOR
110V
127V
220V
240V
YLW
GRY
RED
ORN
BLK
BLU
P SW
AC IN
F1
CONNECTER PANEL
BLU
BLK
YLW
ORN
RED
GRY
BRN
40V
18V
T.F
POWER TRANS
VIDEO
AUDIO
CHG+
BATT SW
GND
12V
TO VCR
07 TIMER
TIMER SET
10V
AC
TIMER CTL
GND
12V
BUFFER
COMPARATOR
A L U
MEMORY
F D P DRIVER
OSC
400 KHz OSC CF1
COUNTER
PRE START CONTROL X2
INVERTER X3
RESET X2
+10V
DC DC CONVERTER
10
09
X103
X102
08
X001
X101
REGURATOR
01
D11
F2
F3
19V RECT D1
50V RECT D2
TIMER CTL X1, D3
12V REG X2,3 D5
12V REG D8
10V REG IC 1
D12
CHG START RY 1
TIMER SET
CHG+
BATT SW
GND
18V
SWD UNREG
UNREG
CHG LED
CHG START
CHG START
D13
D10
F4

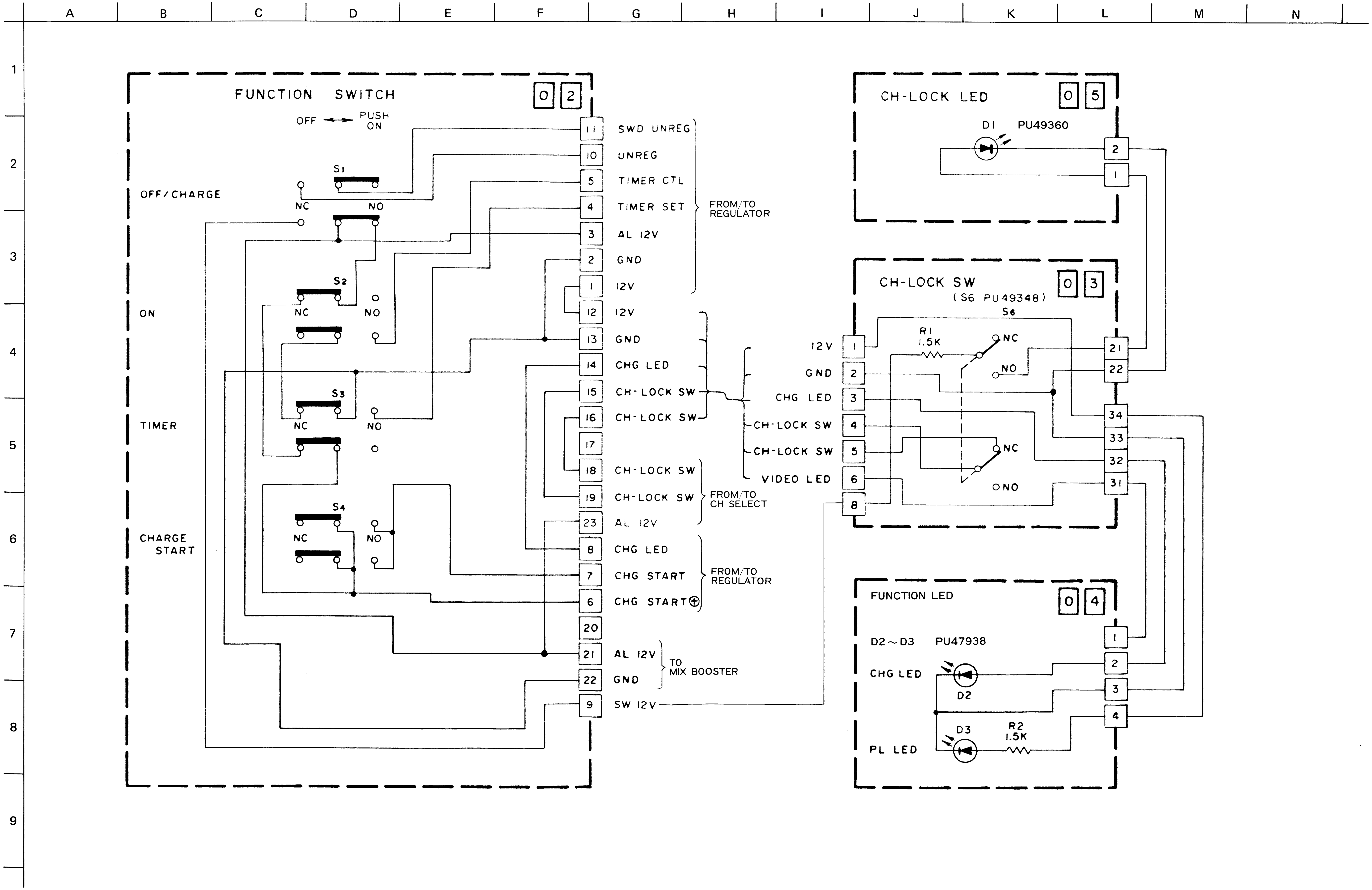
5.4 CHANNEL SELECT SWITCH SCHEMATIC DIAGRAM AND CIRCUIT BOARD


0 6
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
R1
1K
D13 – D24 SLR-54MT4
D1 – D12 MA161
11
12
13
14
15
16
17
21
22
23
24
25
26
27
CH 1
CH 2
CH 3
CH 4
CH 5
CH 6
CH 7
CH 8
CH 9
CH 10
CH 11
CH 12
+12V
COMMON
TO PRE-SET 11~17
FROM/TO PRE-SET 21~27


0 6
D24
D23
D22
D21
D20
D19
D18
D17
D16
D15
D14
D13
CH-K
CH-K
CH-J
CH-I
CH-H
CH-G
CH-F
CH-E
CH-D
CH-C
CH-B
CH-A
D7
D3
S12
S11
S10
S9
S8
S7
S6
S5
S4
S3
S2
S1
D11
D10
D9
D6
D5
D2
B6
B5
B4
D12
D8
D1
B3
B2
B1
D4
R1
26
23
21
16
14
12
27
25
24
22
17
15
13
11

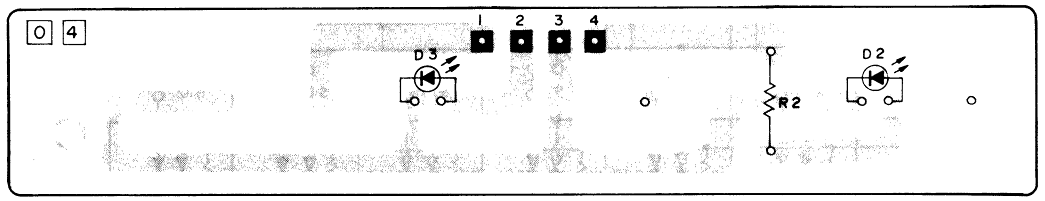
5-5 CH. SELECT SWITCH SCHEMATIC AND BOARD
(FUNCTION AND CH. LOCK SWITCH SCHEMATIC)

5.5 FUNCTION AND CHANNEL LOCK SWITCH SCHEMATIC DIAGRAM

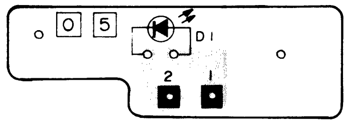

A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
FUNCTION SWITCH
02
OFF ↔ PUSH ON
OFF/CHARGE
ON
TIMER
CHARGE START
S1
S2
S3
S4
NC
NO
SWD UNREG
UNREG
TIMER CTL
TIMER SET
AL 12V
GND
12V
CHG LED
CH-LOCK SW
CHG START
CHG START⊕
SW 12V
FROM/TO REGULATOR
FROM/TO CH SELECT
TO MIX BOOSTER
CH-LOCK LED
05
D1 PU49360
CH-LOCK SW
03
(S6 PU49348)
S6
R1 1.5K
VIDEO LED
FUNCTION LED
04
D2～D3 PU47938
CHG LED
D2
D3
R2 1.5K
PL LED

5.6 FUNCTION AND CHANNEL LOCK SWITCH CIRCUIT BOARDS

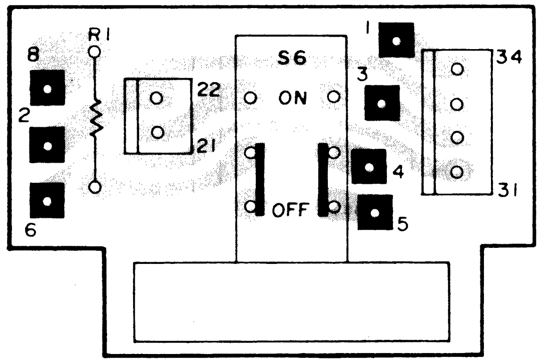
– FUNCTION LED CIRCUIT BOARD –


0 4
1 2 3 4
D3
D2
R2

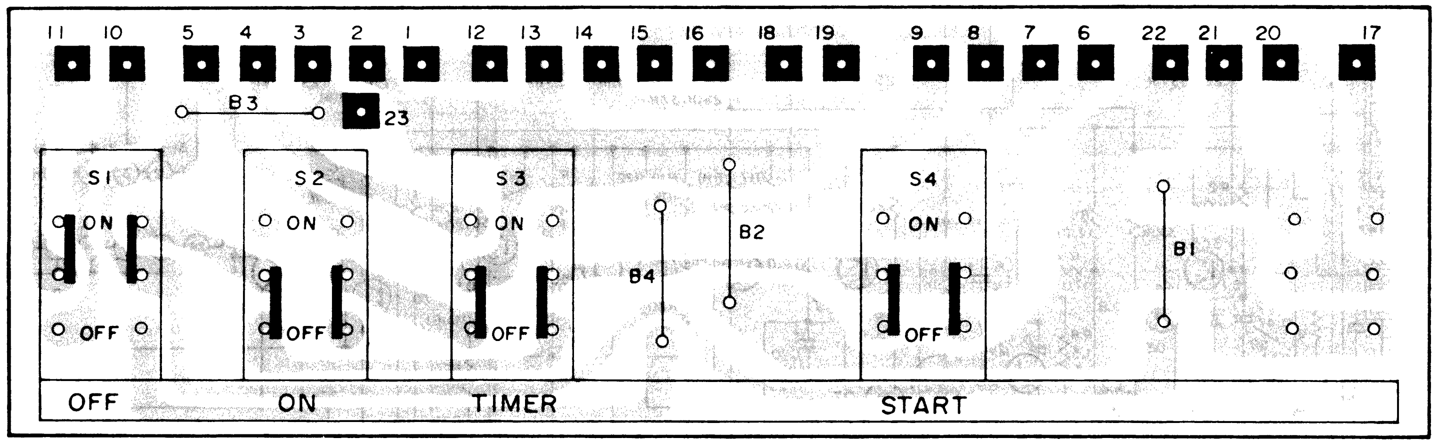
– CH. LOCK LED CIRCUIT BOARD –



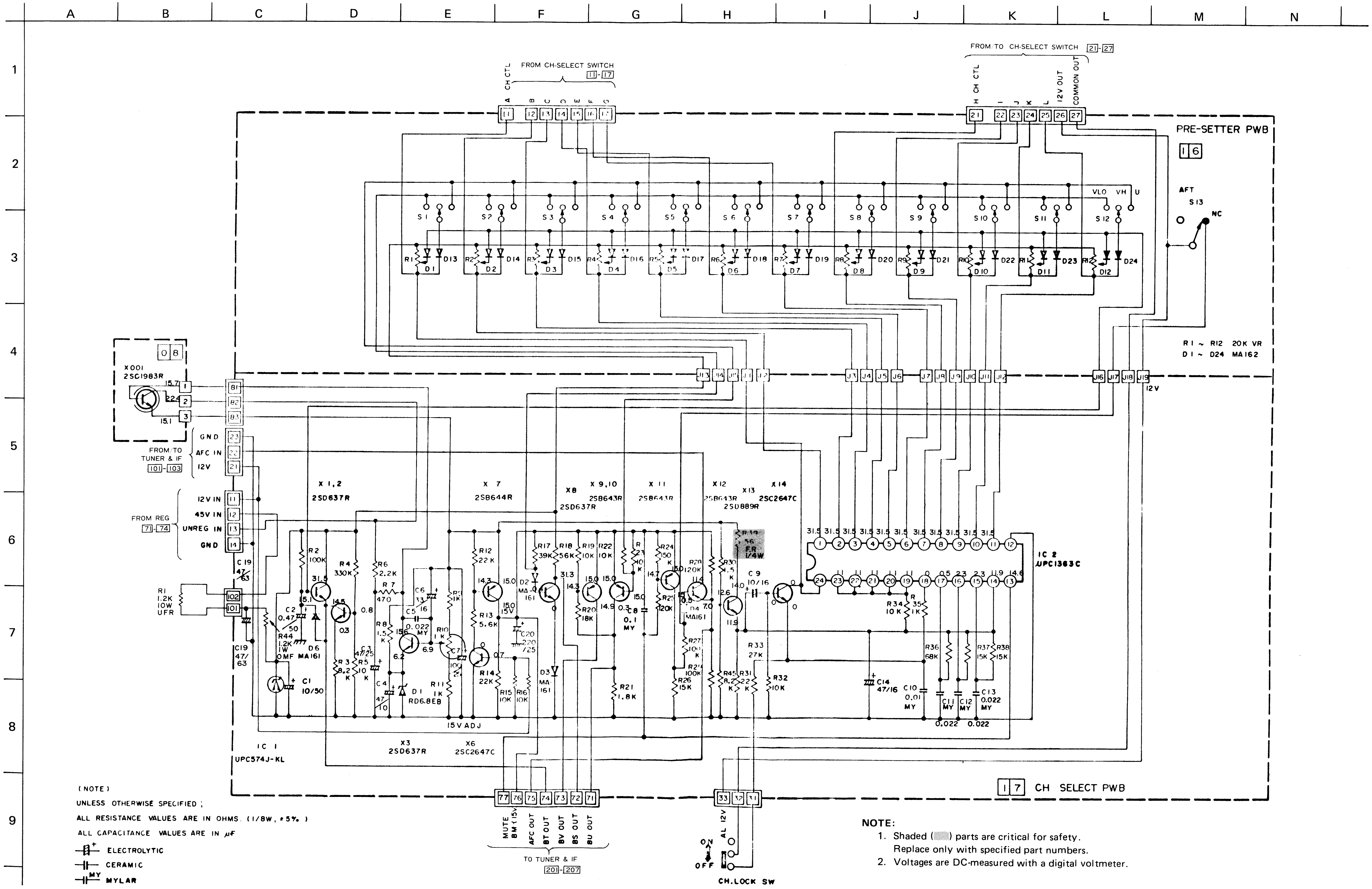
– CH. LOCK SWITCH CIRCUIT BOARD –


R1
8
2
6
22
21
S6
ON
OFF
1
3
4
5
34
31

– FUNCTION SWITCH CIRCUIT BOARD –


11 10 5 4 3 2 1 12 13 14 15 16 18 19 9 8 7 6 22 21 20 17
B3
23
S1
ON
OFF
S2
ON
OFF
S3
ON
OFF
B4
B2
S4
ON
OFF
B1
OFF
ON
TIMER
START

5.7 PRE-SETTER AND CHANNEL SELECT SCHEMATIC DIAGRAM-1 (EG)

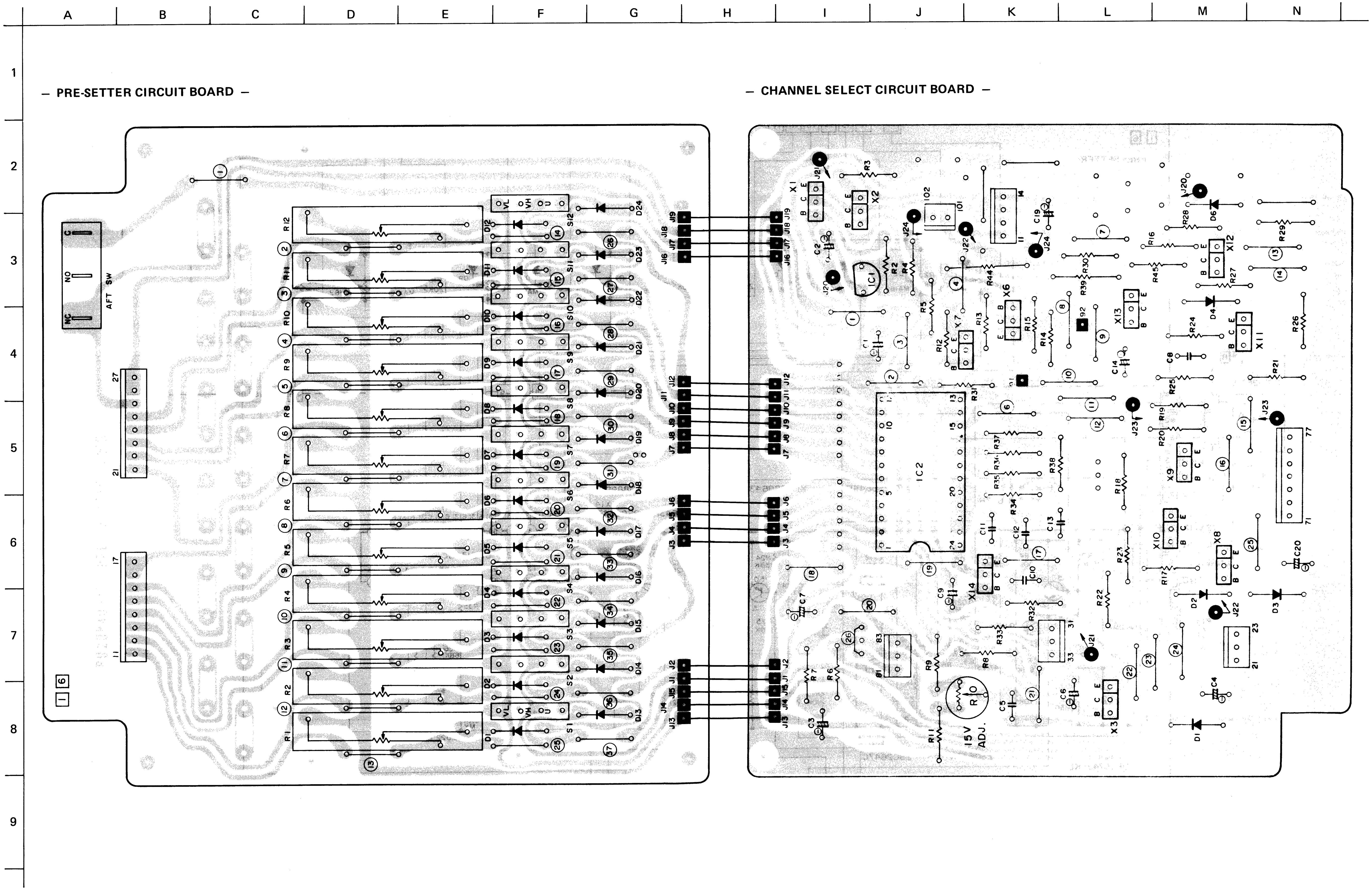

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
FROM CH-SELECT SWITCH 11-17
CH CTL
A B C D E F G
FROM/TO CH-SELECT SWITCH 21-27
H CH CTL
I J K L
12V OUT
COMMON OUT
PRE-SETTER PWB
16
AFT
S13
NC
VLO VH U
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12
D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12
D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 D23 D24
R1 ~ R12 20K VR
D1 ~ D24 MA162
12V
08
X001
2SC1983R
GND
AFC IN
12V
FROM/TO TUNER & IF 101-103
12V IN
45V IN
UNREG IN
GND
FROM REG 71-74
R1 1.2K 10W UFR
X1,2 2SD637R
X7 2SB644R
X8 2SD637R
X9,10 2SB643R
X11 2SB643R
X12 2SB643R
X13 2SD889R
X14 2SC2647C
R19 56 F.R 1/4W
IC 2 UPC1363C
IC 1 UPC574J-KL
X3 2SD637R
X6 2SC2647C
15V ADJ
17 CH SELECT PWB
MUTE
BM (15V)
AFC OUT
BT OUT
BV OUT
BS OUT
BU OUT
TO TUNER & IF 201-207
AL 12V
ON
OFF
CH.LOCK SW

(NOTE)
UNLESS OTHERWISE SPECIFIED ;
ALL RESISTANCE VALUES ARE IN OHMS. (1/8W, ±5%)
ALL CAPACITANCE VALUES ARE IN μF

ELECTROLYTIC
CERAMIC
MYLAR

NOTE:
1. Shaded (▨) parts are critical for safety.
Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter.

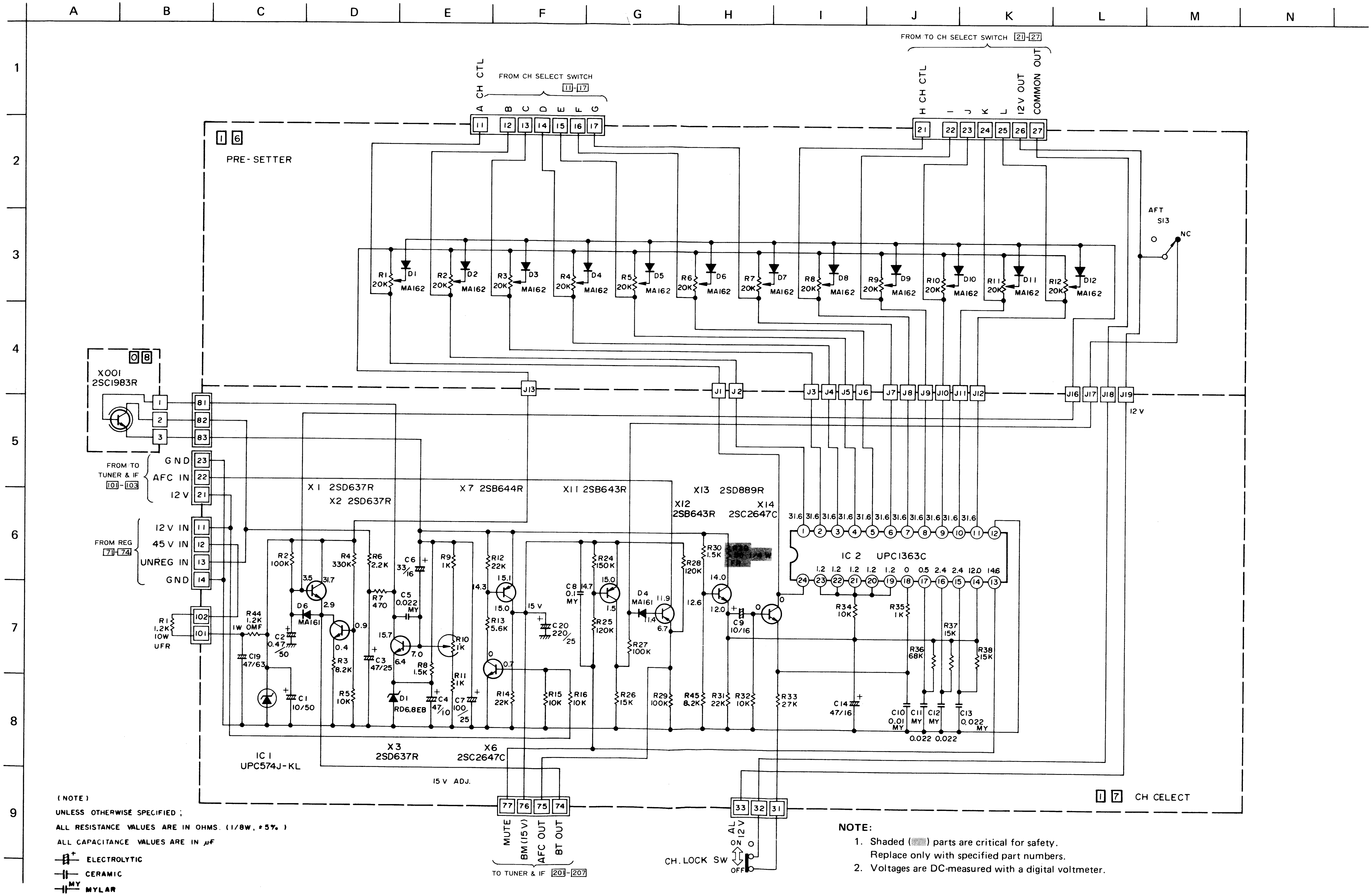
5.8 PRE-SETTER AND CHANNEL SELECT CIRCUIT BOARDS-1 (EG)


— PRE-SETTER CIRCUIT BOARD —

— CHANNEL SELECT CIRCUIT BOARD —

A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
AFT SW
NC
NO
C
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
VL
VH
U
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
J19
IC1
IC2
X1
X2
X3
X6
X7
X8
X9
X10
X11
X12
X13
X14
B C E
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C19
C20
R3
R4
R5
R6
R7
R8
R9
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R37
R38
R39
R44
R45
R10
15V ADJ.
J20
J21
J22
J23
J24
101
102
11
14
21
23
31
33
71
77
81
83
91
92

5.9 PRE-SETTER AND CHANNEL SELECT SCHEMATIC DIAGRAM-2 (EK)


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
FROM CH SELECT SWITCH 11-17
A CH CTL
B
C
D
E
F
G
11 12 13 14 15 16 17
FROM TO CH SELECT SWITCH 21-27
H CH CTL
I
J
K
L
12 V OUT
COMMON OUT
21 22 23 24 25 26 27
1 6
PRE-SETTER
R1 20K D1 MA162
R2 20K D2 MA162
R3 20K D3 MA162
R4 20K D4 MA162
R5 20K D5 MA162
R6 20K D6 MA162
R7 20K D7 MA162
R8 20K D8 MA162
R9 20K D9 MA162
R10 20K D10 MA162
R11 20K D11 MA162
R12 20K D12 MA162
AFT S13
NC
0 8
X001 2SC1983R
81 82 83
FROM TO TUNER & IF 101-103
GND 23
AFC IN 22
12 V 21
FROM REG 71-74
12 V IN 11
45 V IN 12
UNREG IN 13
GND 14
102 101
R1 1.2K 10W UFR
J13 J1 J2 J3 J4 J5 J6 J7 J8 J9 J10 J11 J12 J16 J17 J18 J19
12 V
X1 2SD637R
X2 2SD637R
X7 2SB644R
X11 2SB643R
X13 2SD889R
X12 2SB643R
X14 2SC2647C
IC 2 UPC1363C
31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6 31.6
1.2 1.2 1.2 1.2 1.2 0 0.5 2.4 2.4 12.0 14.6
R2 100K
R4 330K
R6 2.2K
C6 33/16
R9 1K
R12 22K
C8 0.1 MY
R24 150K
R28 120K
R30 1.5K
R44 1.2K 1W OMF
D6 MA161
R7 470
C5 0.022 MY
C2 0.47/50
C19 47/63
C1 10/50
R3 8.2K
C3 47/25
R8 1.5K
R10 1K
R11 1K
R5 10K
D1 RD6.8EB
C4 47/10
C7 100/25
R13 5.6K
R14 22K
15 V
C20 220/25
R15 10K
R16 10K
R25 120K
D4 MA161
R27 100K
R26 15K
R29 100K
R45 8.2K
R31 22K
R32 10K
R33 27K
C9 10/16
R34 10K
R35 1K
R36 68K
R37 15K
R38 15K
C14 47/16
C10 0.01 MY
C11 MY
C12 MY
C13 0.022 MY
0.022 0.022
3.5 31.7 2.9 0.9 0.4 15.7 6.4 7.0 14.3 15.1 15.0 0.7 14.7 15.0 1.5 11.9 11.4 6.7 12.6 14.0 12.0 0 0
IC 1 UPC574J-KL
X3 2SD637R
X6 2SC2647C
15 V ADJ.
1 7 CH CELECT
77 76 75 74
MUTE
BM (15 V)
AFC OUT
BT OUT
TO TUNER & IF 201-207
33 32 31
AL 12 V
ON
OFF
CH. LOCK SW

(NOTE)

UNLESS OTHERWISE SPECIFIED ;

ALL RESISTANCE VALUES ARE IN OHMS. (1/8W, ±5%)

ALL CAPACITANCE VALUES ARE IN μF

ELECTROLYTIC

CERAMIC

MYLAR

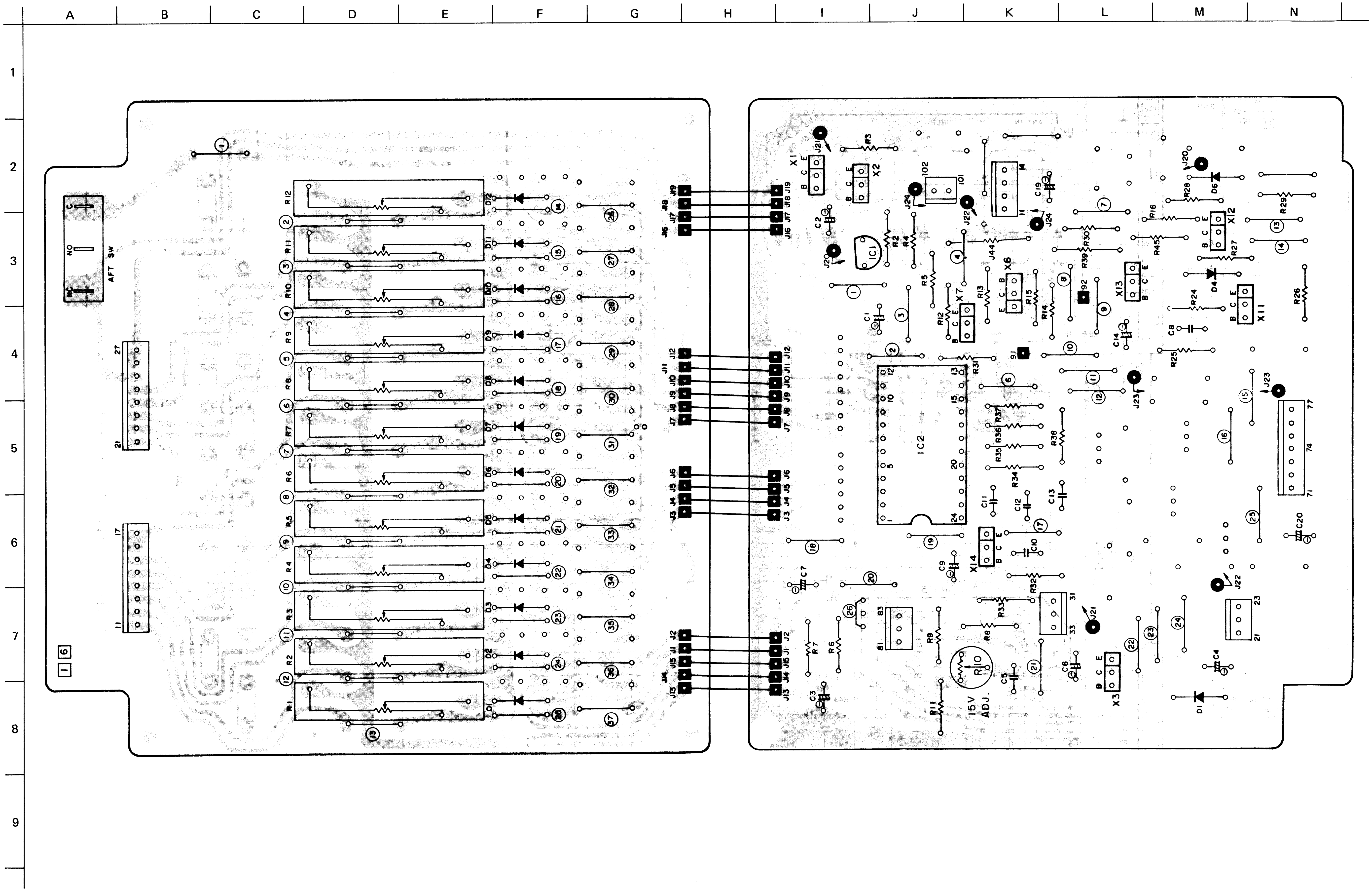
NOTE:

1. Shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter.

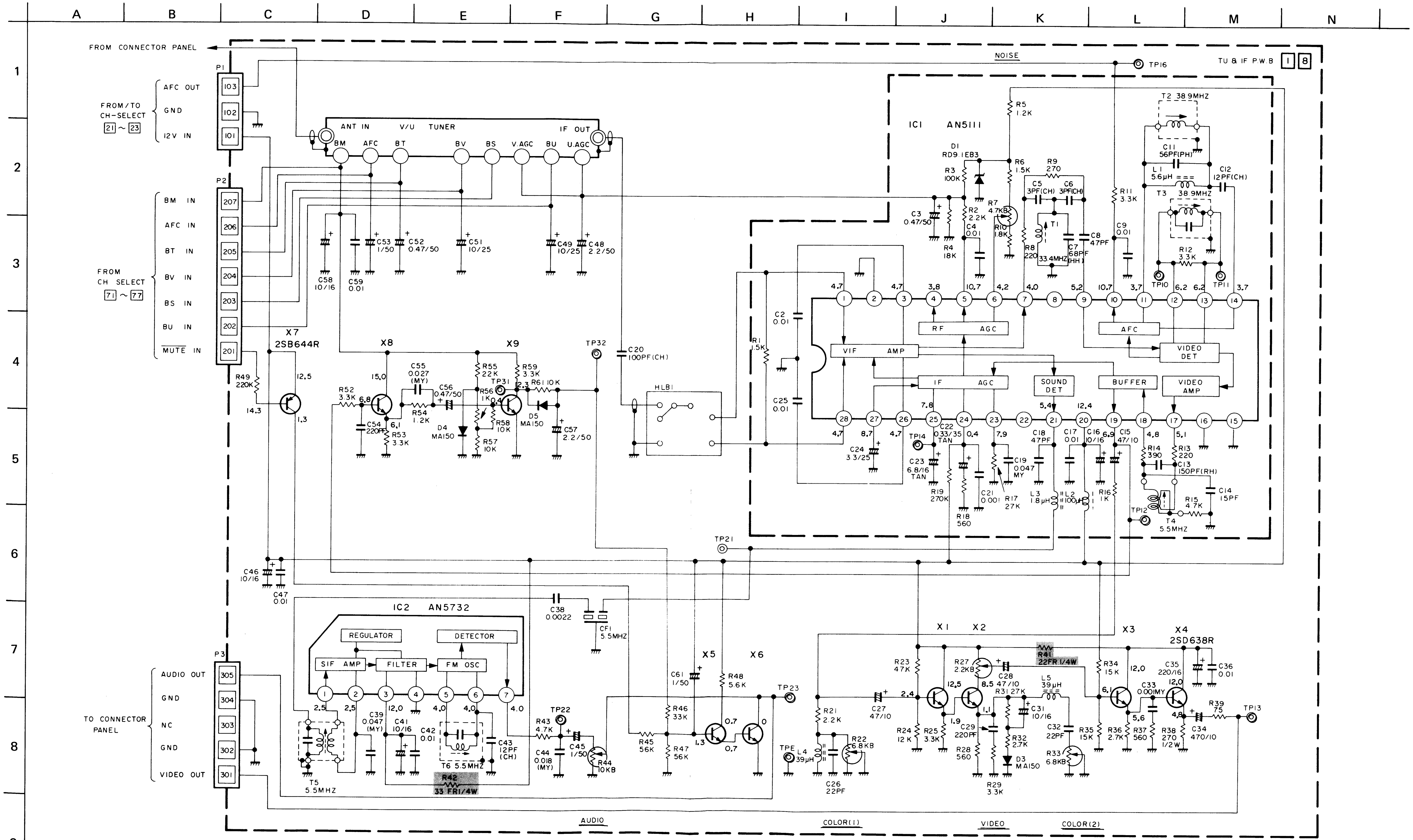
PRE-SET AND CH. SELECT SCHEMATIC-2 (PRE-SET AND CH. SELECT BOARDS-1)

5-10 PRE-SET AND CH. SELECT SCHEMATIC-2 (PRE-SET AND CH. SELECT BOARDS-1)

5.10 PRE-SETTER AND CHANNEL SELECT CIRCUIT BOARDS-2 (EK)


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
AFT SW
NC
NO
C
27
21
17
11
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
J19
IC1
IC2
X1
X2
X3
X6
X7
X11
X12
X13
X14
B C E
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C19
C20
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R45
J20
J21
J22
J23
J24
J44
D1
D4
D6
91
92
101
102
11
14
21
23
31
33
71
74
77
81
83
15V ADJ.

5.11 TUNER & IF SCHEMATIC DIAGRAM-1 (EG)


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
FROM CONNECTOR PANEL
P1
AFC OUT
GND
12V IN
FROM/TO CH-SELECT 21 ~ 23
103
102
101
P2
BM IN
AFC IN
BT IN
BV IN
BS IN
BU IN
MUTE IN
FROM CH SELECT 71 ~ 77
207
206
205
204
203
202
201
ANT IN
V/U TUNER
IF OUT
BM
AFC
BT
BV
BS
V.AGC
BU
U.AGC
C58 10/16
C59 0.01
C53 1/50
C52 0.47/50
C51 10/25
C49 10/25
C48 2.2/50
X7 2SB644R
R49 220K
12.5
14.3
1.3
X8
15.0
R52 3.3K
6.8
C54 220PF
6.1
R53 3.3K
C55 0.027 (MY)
R54 1.2K
C56 0.47/50
D4 MA150
R55 22K
TP31
R56 1K
0.4
R58 10K
R57 10K
X9
R59 3.3K
12.3
R61 10K
D5 MA150
C57 2.2/50
TP32
C20 100PF(CH)
HLB1
NOISE
TP16
TU & IF P.W.B 1 8
IC1 AN5111
R5 1.2K
D1 RD9.1EB3
R3 100K
R6 1.5K
R9 270
C5 3PF(CH)
C6 3PF(CH)
R7 4.7KB
R10 1.8K
R2 2.2K
C4 0.01
R4 18K
C3 0.47/50
T1
R8 220
33.4MHZ
C7 68PF (HH)
C8 47PF
R11 3.3K
C9 0.01
T2 38.9MHZ
C11 56PF(PH)
L1 5.6μH
C12 12PF(CH)
T3 38.9MHZ
R12 3.3K
TP10
TP11
C2 0.01
R1 1.5K
C25 0.01
4.7
4.7
3.8
10.7
4.2
4.0
5.2
10.7
3.7
6.2
6.2
3.7
RF AGC
AFC
VIF AMP
VIDEO DET
IF AGC
SOUND DET
BUFFER
VIDEO AMP
7.8
5.4
12.4
4.7
8.7
4.7
TP14
C22 0.33/35 TAN
0.4
7.9
C18 47PF
C17 0.01
C16 10/16
6.9
C15 47/10
4.8
5.1
C24 3.3/25
C23 6.8/16 TAN
R19 270K
R18 560
C21 0.001
R17 27K
C19 0.047 MY
L3 1.8μH
L2 100μH
R16 1K
R14 390
R13 220
C13 150PF(RH)
C14 15PF
R15 4.7K
TP12
T4 5.5MHZ
TP21
C46 10/16
C47 0.01
IC2 AN5732
REGULATOR
DETECTOR
SIF AMP
FILTER
FM OSC
C38 0.0022
CF1 5.5MHZ
P3
AUDIO OUT
GND
NC
GND
VIDEO OUT
TO CONNECTOR PANEL
305
304
303
302
301
2.5
2.5
12.0
4.0
4.0
4.0
C39 0.047 (MY)
C41 10/16
C42 0.01
C43 12PF (CH)
T5 5.5MHZ
T6 5.5MHZ
R42 33 FR1/4W
TP22
R43 4.7K
C44 0.018 (MY)
C45 1/50
R44 10KB
X5
X6
C61 1/50
R48 5.6K
R46 33K
R45 56K
R47 56K
1.3
0.7
0.7
0
TP23
X1
X2
R23 47K
R27 2.2KB
C28 47/10
R41 22FR 1/4W
2.4
12.5
8.5
R24 12K
R25 3.3K
1.9
1.1
C29 220PF
R28 560
R31 27K
L5 39μH
C31 10/16
R32 2.7K
D3 MA150
R29 3.3K
C32 22PF
R33 6.8KB
R21 2.2K
C27 47/10
TPE
L4 39μH
R22 6.8KB
C26 22PF
X3
X4 2SD638R
R34 15K
12.0
6.1
C35 220/16
C36 0.01
C33 0.001MY
12.0
5.6
4.8
R35 15K
R36 2.7K
R37 560
R38 270 1/2W
C34 470/10
R39 75
TP13
AUDIO
COLOR(1)
VIDEO
COLOR(2)

NOTE: 1. UNLESS OTHERWISE SPECIFIED

1) TRANSISTOR

X1 ~ X3	2SC2647C
X5,6,8,9	2SD637R

2) DIODE

D3 ~ D5 MA150

3) RESISTORS VALUES ARE IN OHMS

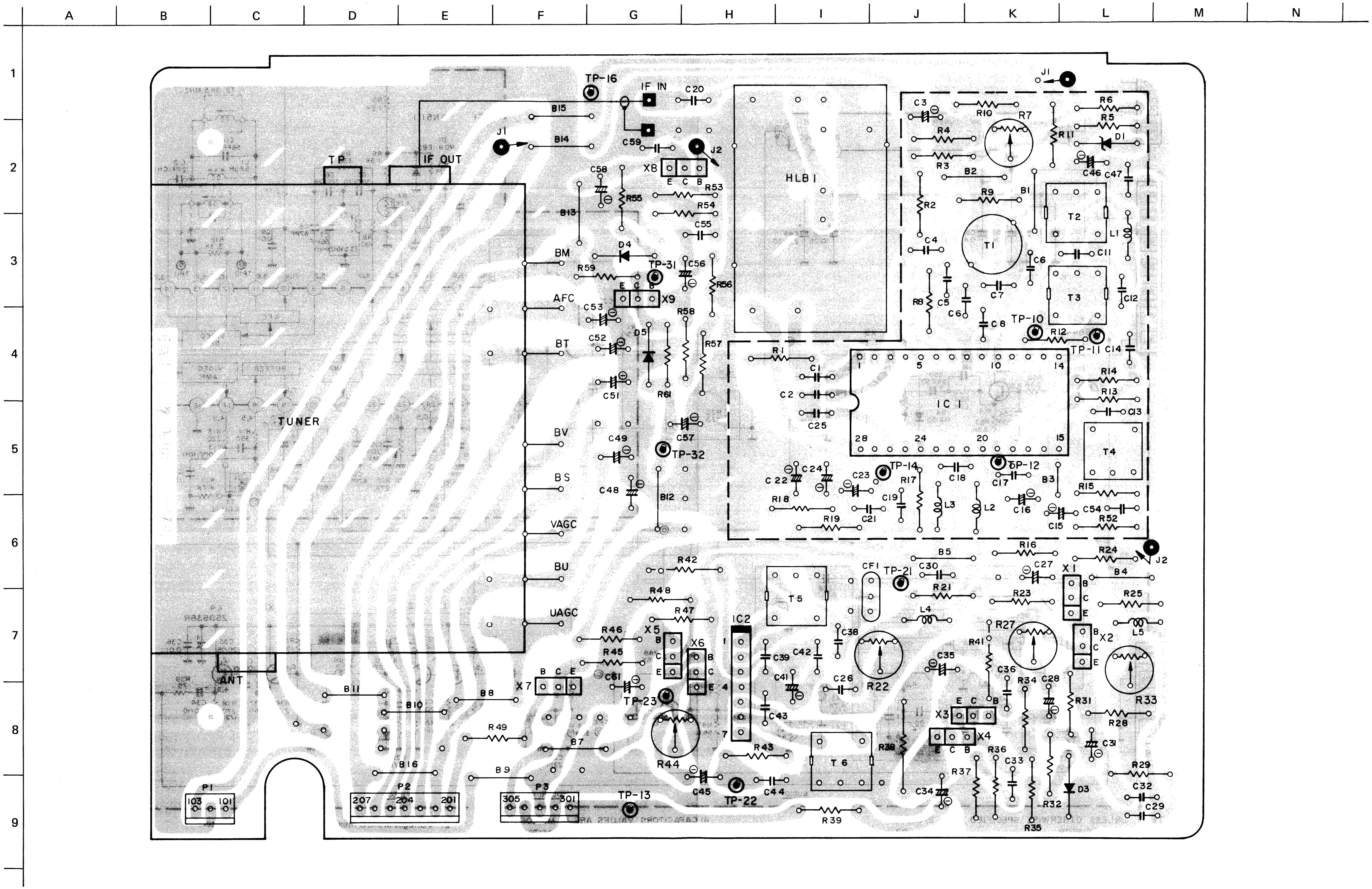
(1/8W CARBON RESISTOR)

4) CAPACITORS VALUES ARE IN MICROFARADS.

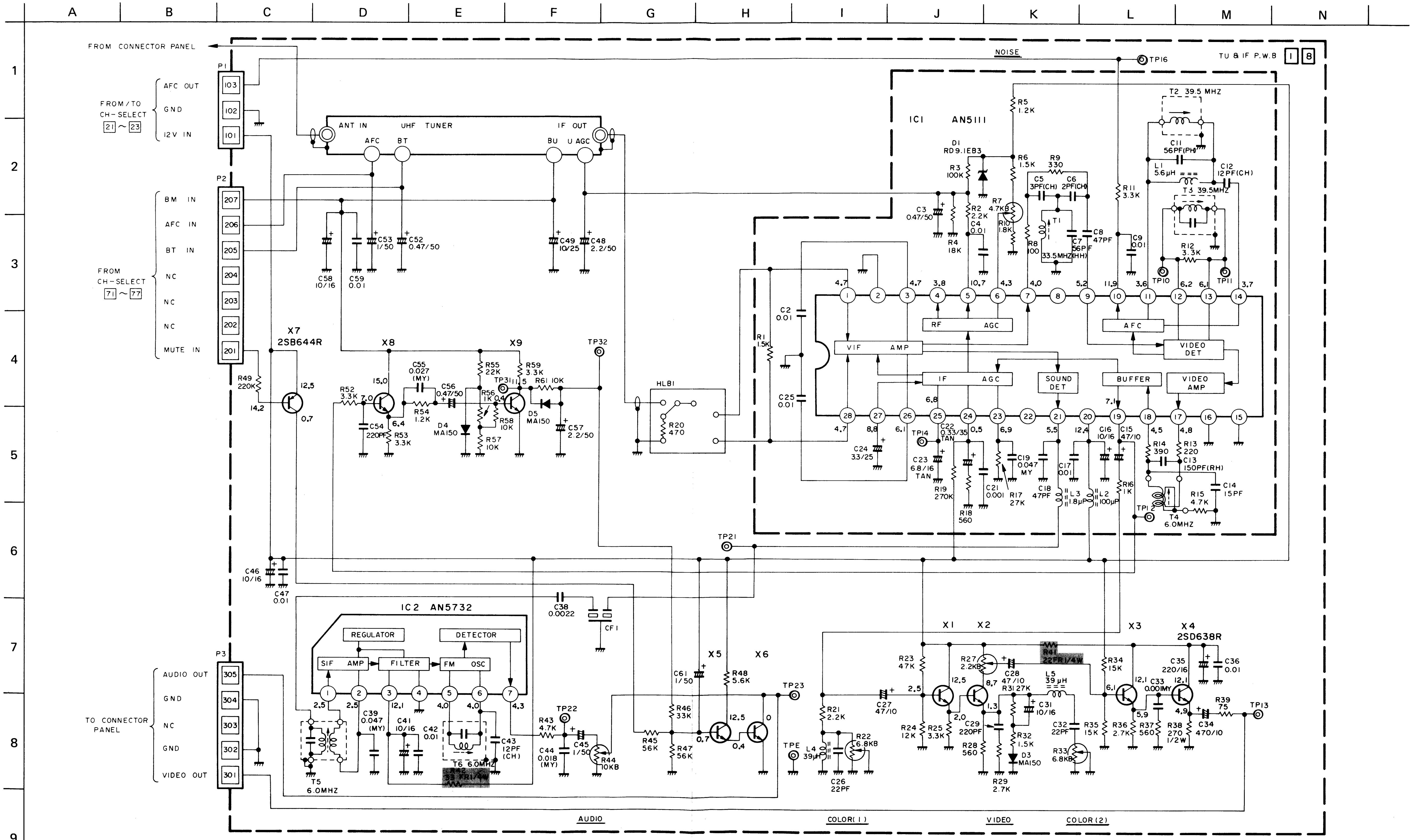
- ELECTROLYTIC CAPACITOR
- CERAMIC CAPACITOR
- MY MYLAR CAPACITOR
- TAN TANTALUM CAPACITOR

2. Voltages are DC measured with a digital voltmeter.
3. Shaded (▨) parts are critical for safety.
Replace only with specifed part numbers.

5.12 TUNER & IF CIRCUIT BOARD-1 (EG)


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
TP-16
IF IN
C20
B15
B14
J1
J2
C59
X8
E C B
R53
R54
C55
C58
R55
B13
TP
IF OUT
TUNER
BM
AFC
BT
BV
BS
VAGC
BU
UAGC
D4
R59
TP-31
C56
R56
X9
C53
R58
D5
C52
R57
C51
R61
C57
C49
TP-32
C48
B12
HLB1
C3
R10
R7
R4
R3
B2
R11
R6
R5
D1
C46
C47
R9
B1
R2
T2
T1
L1
C4
C6
C11
C5
C7
T3
C12
R8
C8
TP-10
R12
TP-11
C14
R1
C1
C2
C25
IC1
1
5
10
14
28
24
20
15
R14
R13
C13
T4
C22
C24
C23
TP-14
R17
C18
TP-12
C17
B3
R15
R18
C19
L3
L2
C16
C15
C54
R19
C21
R52
R16
R24
B5
C30
C27
X1
B4
R42
CF1
TP-21
T5
R21
R23
R25
R48
L4
B
C
E
L5
R47
IC2
C38
R27
X2
R46
X5
X6
R41
R45
C39
C42
C35
C41
C26
R22
C36
R34
C28
R31
R33
X7
C61
TP-23
C43
B11
B8
B10
X3
X4
R28
R49
B7
R44
R43
R30
R36
C31
B16
B9
C45
C44
T6
R37
C33
C34
R32
R29
D3
C32
C29
P1
P2
P3
103
101
207
204
201
305
301
TP-13
TP-22
R39
R35
ANT

5.13 TUNER & IF SCHEMATIC DIAGRAM-2 (EK)


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
FROM CONNECTOR PANEL
TU & IF P.W.B 1 8
NOISE
TP16
P1
AFC OUT
GND
12V IN
103
102
101
FROM/TO CH-SELECT 21 ~ 23
ANT IN
UHF TUNER
IF OUT
AFC
BT
BU
U AGC
P2
BM IN
AFC IN
BT IN
NC
NC
NC
MUTE IN
207
206
205
204
203
202
201
FROM CH-SELECT 71 ~ 77
C53 1/50
C52 0.47/50
C49 10/25
C48 2.2/50
C58 10/16
C59 0.01
X7 2SB644R
X8
X9
TP32
R49 220K
12.5
14.2
0.7
R52 3.3K
15.0
7.0
6.4
C55 0.027 (MY)
C56 0.47/50
R54 1.2K
C54 220PF
R53 3.3K
D4 MA150
R55 22K
TP31
R56 1K
0.4
R58 10K
R57 10K
R59 3.3K
R61 10K
D5 MA150
C57 2.2/50
HLB1
R20 470
IC1 AN5111
D1 RD9.1EB3
R3 100K
R2 2.2K
C4 0.01
R4 18K
C3 0.47/50
R5 1.2K
R6 1.5K
R9 330
R7 4.7KB
R10 1.8K
C5 3PF(CH)
C6 2PF(CH)
T1
R8 100
C7 56PF
33.5MHZ(HH)
C8 47PF
R11 3.3K
C9 0.01
T2 39.5 MHZ
C11 56PF(PH)
L1 5.6μH
C12 12PF(CH)
T3 39.5MHZ
R12 3.3K
TP10
TP11
C2 0.01
R1 1.5K
C25 0.01
4.7 3.8 10.7 4.3 4.0 5.2 11.9 3.6 6.2 6.1 3.7
1 2 3 4 5 6 7 8 9 10 11 12 13 14
RF AGC
AFC
VIF AMP
VIDEO DET
IF AGC
SOUND DET
BUFFER
VIDEO AMP
6.8
7.1
28 27 26 25 24 23 22 21 20 19 18 17 16 15
4.7 8.8 6.1 0.5 6.9 5.5 12.4 4.5 4.8
TP14
C22 0.33/35 TAN
C24 33/25
C23 6.8/16 TAN
R19 270K
R18 560
C21 0.001
R17 27K
C19 0.047 MY
C17 .001
C18 47PF
L3 1.8μH
C16 10/16
C15 47/10
L2 100μH
R16 1K
R14 390
R13 220
C13 150PF(RH)
C14 15PF
R15 4.7K
TP12
T4 6.0MHZ
TP21
C46 10/16
C47 0.01
C38 0.0022
CF1
IC2 AN5732
REGULATOR
DETECTOR
SIF AMP
FILTER
FM OSC
1 2 3 4 5 6 7
2.5 2.5 12.1 4.0 4.0 4.3
C39 0.047 (MY)
C41 10/16
C42 0.01
C43 12PF (CH)
T5 6.0MHZ
T6 6.0MHZ
R42 33 FR1/4W
TP22
R43 4.7K
C44 0.018 (MY)
C45 1/50
R44 10KB
X5
X6
C61 1/50
R48 5.6K
R46 33K
R45 56K
R47 56K
12.5
0
0.7
0.4
TP23
P3
AUDIO OUT
GND
NC
GND
VIDEO OUT
305
304
303
302
301
TO CONNECTOR PANEL
X1
X2
X3
X4 2SD638R
R23 47K
R27 2.2KB
C28 47/10
R41 22FR1/4W
L5 39μH
R31 27K
R34 15K
C35 220/16
C36 0.01
C33 0.001MY
12.5
8.7
6.1
12.1
12.1
2.5
1.3
2.0
5.9
4.9
R21 2.2K
C27 47/10
R24 12K
R25 3.3K
C29 220PF
R28 560
C31 10/16
R32 1.5K
D3 MA150
R29 2.7K
C32 22PF
R33 6.8KB
R35 15K
R36 2.7K
R37 560
R38 270 1/2W
C34 470/10
R39 75
TP13
TPE
L4 39μH
C26 22PF
R22 6.8KB
AUDIO
COLOR(1)
VIDEO
COLOR(2)

NOTE: 1. UNLESS OTHERWISE SPECIFIED

1) TRANSISTOR

X1 ~ X3	2SC2647C
X5,6,8,9	2SD637R

2) DIODE

D3 ~ D5 MA 150

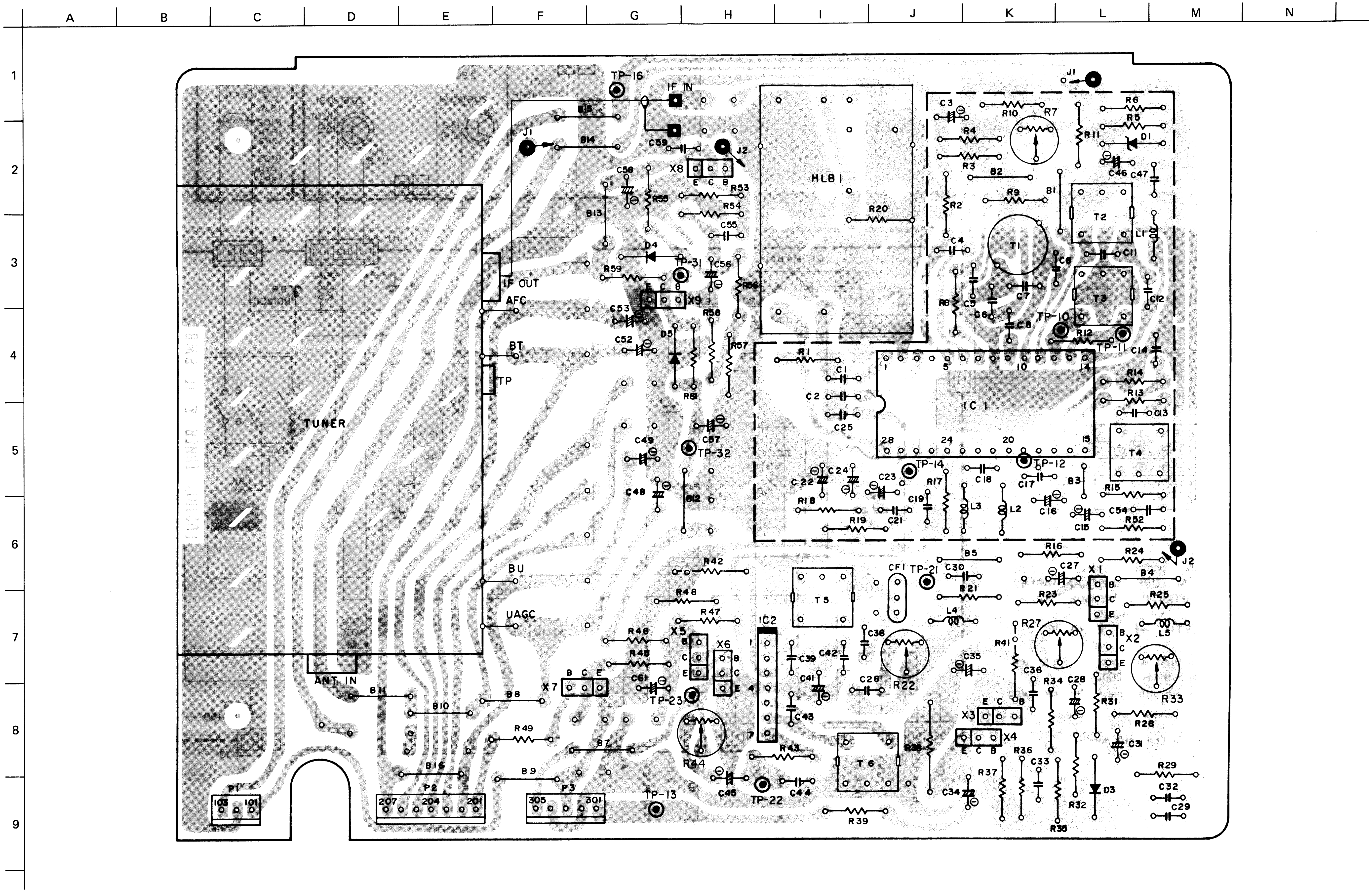
3) RESISTORS VALUES ARE IN OHMS.
(1/8W CARBON RESISTOR)

4) CAPACITORS VALUES ARE IN MICROFARADS

- ELECTROLYTIC CAPACITOR
- CERAMIC CAPACITOR
- MY MYLAR CAPACITOR
- TAN TANTALUM CAPACITOR

2. Voltages are DC measured with a digital voltmeter.
3. Shaded (▨) parts are critical for safety.
Replace only with specifed part numbers.

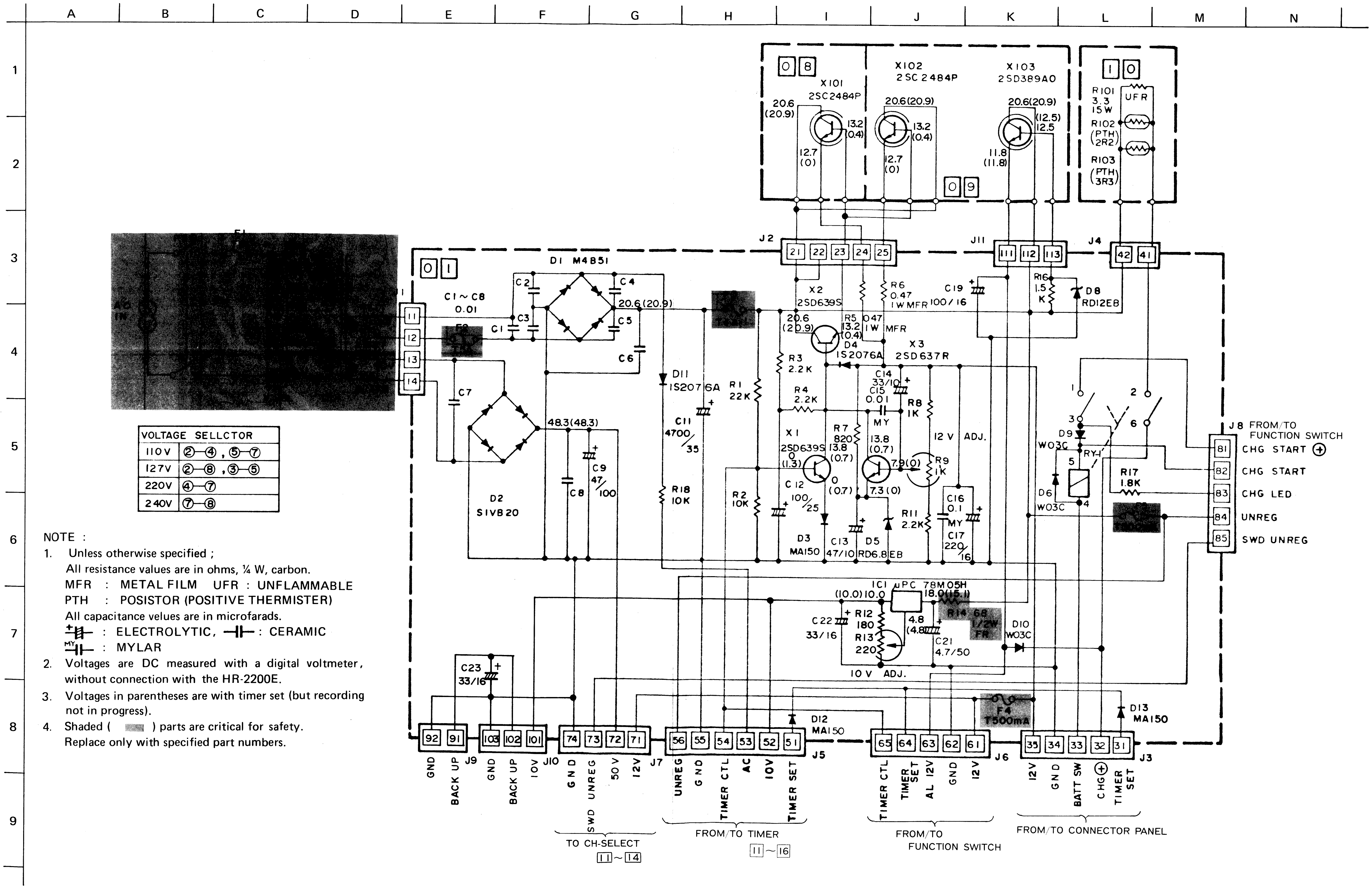
5.14 TUNER & IF CIRCUIT BOARD-2 (EK)


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
TUNER
IF OUT
AFC
BT
TP
BU
UAGC
ANT IN
IF IN
TP-16
J1
J2
HLB1
IC1
IC2
T1
T2
T3
T4
T5
T6
CF1
X1
X2
X3
X4
X5
X6
X7
X8
X9
TP-10
TP-11
TP-12
TP-13
TP-14
TP-21
TP-22
TP-23
TP-31
TP-32
R7
R22
R27
R33
R44
D1
D3
D4
D5
L1
L2
L3
L4
L5
B1
B2
B3
B4
B5
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
P1
103
101
P2
207
204
201
P3
305
301

TUNER & IF BOARD-2
(REGULATOR SCHEMATIC)

TUNER & IF BOARD-2
(REGULATOR SCHEMATIC)

5.15 REGULATOR SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
08
X101 2SC2484P
X102 2SC2484P
X103 2SD389A0
20.6 (20.9)
13.2 (0.4)
12.7 (0)
11.8 (11.8)
(12.5) 12.5
09
10
R101 3.3 15W
UFR
R102 (PTH 2R2)
R103 (PTH 3R3)
J2
21 22 23 24 25
J11
111 112 113
J4
42 41
01
D1 M4B51
C1~C8 0.01
C1 C2 C3 C4 C5 C6 C7 C8
20.6(20.9)
D2 S1VB20
48.3(48.3)
C9 47/100
C11 4700/35
D11 1S2076A
R1 22K
R18 10K
R2 10K
X2 2SD639S
R6 0.47 1W MFR
R5 0.47 1W MFR
C19 100/16
R16 1.5K
D8 RD12EB
20.6 (20.9)
13.2 (0.4)
R3 2.2K
D4 1S2076A
X3 2SD637R
C14 33/10
C15 0.01 MY
R8 1K
R4 2.2K
X1 2SD639S
R7 820
13.8 (0.7)
0 (1.3)
0 (0.7)
7.9(0)
7.3 (0)
R9 1K
12 V ADJ.
C12 100/25
D3 MA150
C13 47/10
D5 RD6.8EB
R11 2.2K
C16 0.1 MY
C17 220/16
1 2 3 4 5 6
D9 W03C
RY-1
D6 W03C
R17 1.8K
J8 FROM/TO FUNCTION SWITCH
81 CHG START ⊕
82 CHG START
83 CHG LED
84 UNREG
85 SWD UNREG
IC1 µPC 78M05H
(10.0) 10.0
18.0 (15.1)
R14 68 1/2W FR
C22 33/16
R12 180
R13 220
4.8 (4.8)
C21 4.7/50
10 V ADJ.
D10 W03C
C23 33/16
D12 MA150
F4 T500mA
D13 MA150
92 91 J9
103 102 101 J10
74 73 72 71 J7
56 55 54 53 52 51 J5
65 64 63 62 61 J6
35 34 33 32 31 J3
GND
BACK UP
GND
BACK UP
10V
GND
SWD UNREG
50 V
12V
UNREG
GND
TIMER CTL
AC
10V
TIMER SET
TIMER CTL
TIMER SET
AL 12V
GND
12V
12V
GND
BATT SW
CHG ⊕
TIMER SET
TO CH-SELECT 11~14
FROM/TO TIMER 11~16
FROM/TO FUNCTION SWITCH
FROM/TO CONNECTOR PANEL

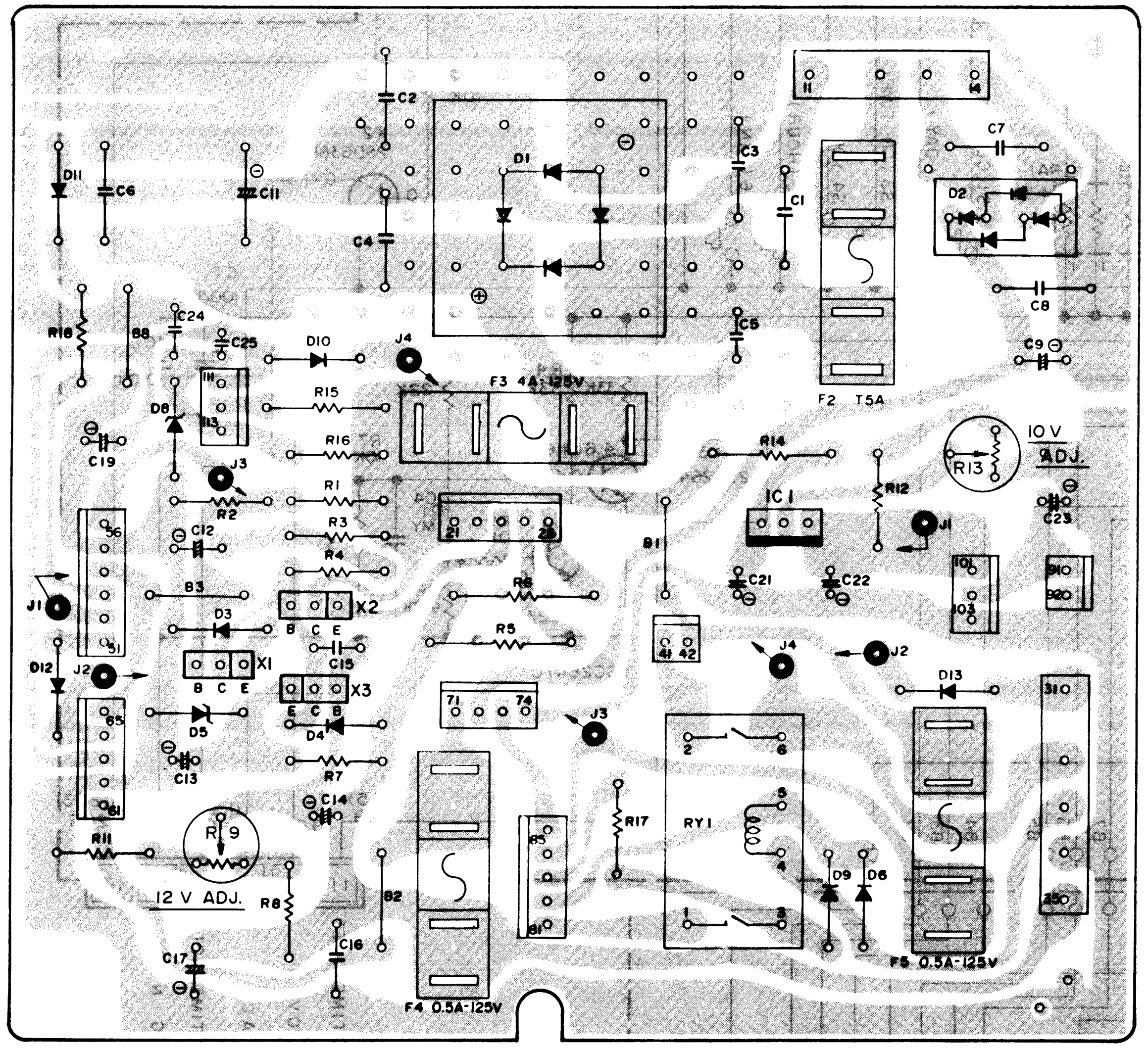
VOLTAGE SELLCTOR	
110V	②—④, ⑤—⑦
127V	②—⑧, ③—⑤
220V	④—⑦
240V	⑦—⑧

NOTE :

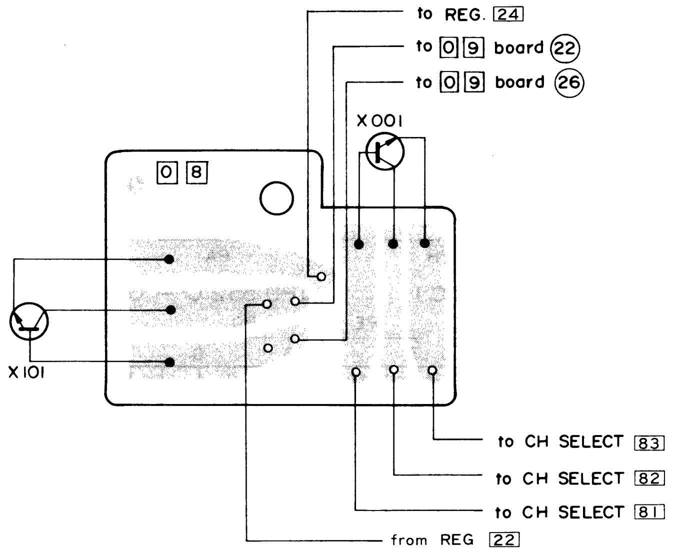
1. Unless otherwise specified ;
   All resistance values are in ohms, ¼ W, carbon.
   MFR : METAL FILM UFR : UNFLAMMABLE
   PTH : POSISTOR (POSITIVE THERMISTER)
   All capacitance velues are in microfarads.
   ⊣⊢ : ELECTROLYTIC, ⊣⊢ : CERAMIC
   MY ⊣⊢ : MYLAR
2. Voltages are DC measured with a digital voltmeter, without connection with the HR-2200E.
3. Voltages in parentheses are with timer set (but recording not in progress).
4. Shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.

5.16 REGULATOR AND POWER SUB CIRCUIT BOARDS

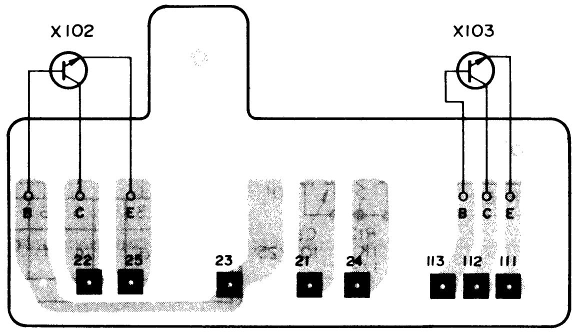
— REGULATOR CIRCUIT BOARD —


D11
C6
C11
C2
C4
D1
C3
C1
C7
D2
C8
C5
R18
88
C24
C25
D10
J4
F3 4A-125V
F2 T5A
C9
D8
R15
R16
C19
J3
R2
R1
R3
R4
R14
R12
R13
10 V ADJ.
C23
IC1
J1
C12
81
21
25
C21
C22
101
103
310
320
83
X2
D3
R6
R5
B C E
C15
X1
J2
D12
J4
J2
41 42
D13
X3
D5
D4
71
74
J3
C13
R7
2
6
C14
R17
RY1
R9
12 V ADJ.
R11
R8
82
C16
85
81
D9
D6
C17
F4 0.5A-125V
F5 0.5A-125V
1
3
4
5
310
350

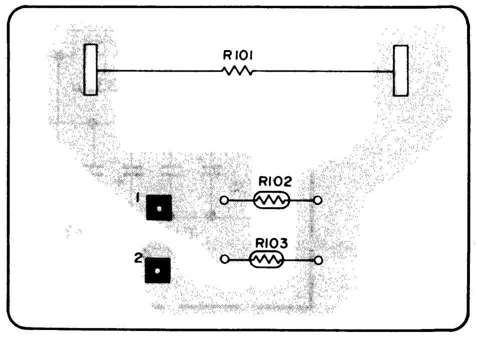
— 08 TRANSISTOR CIRCUIT BOARD —


to REG. 24
to 09 board 22
to 09 board 26
X001
08
X101
to CH SELECT 83
to CH SELECT 82
to CH SELECT 81
from REG 22

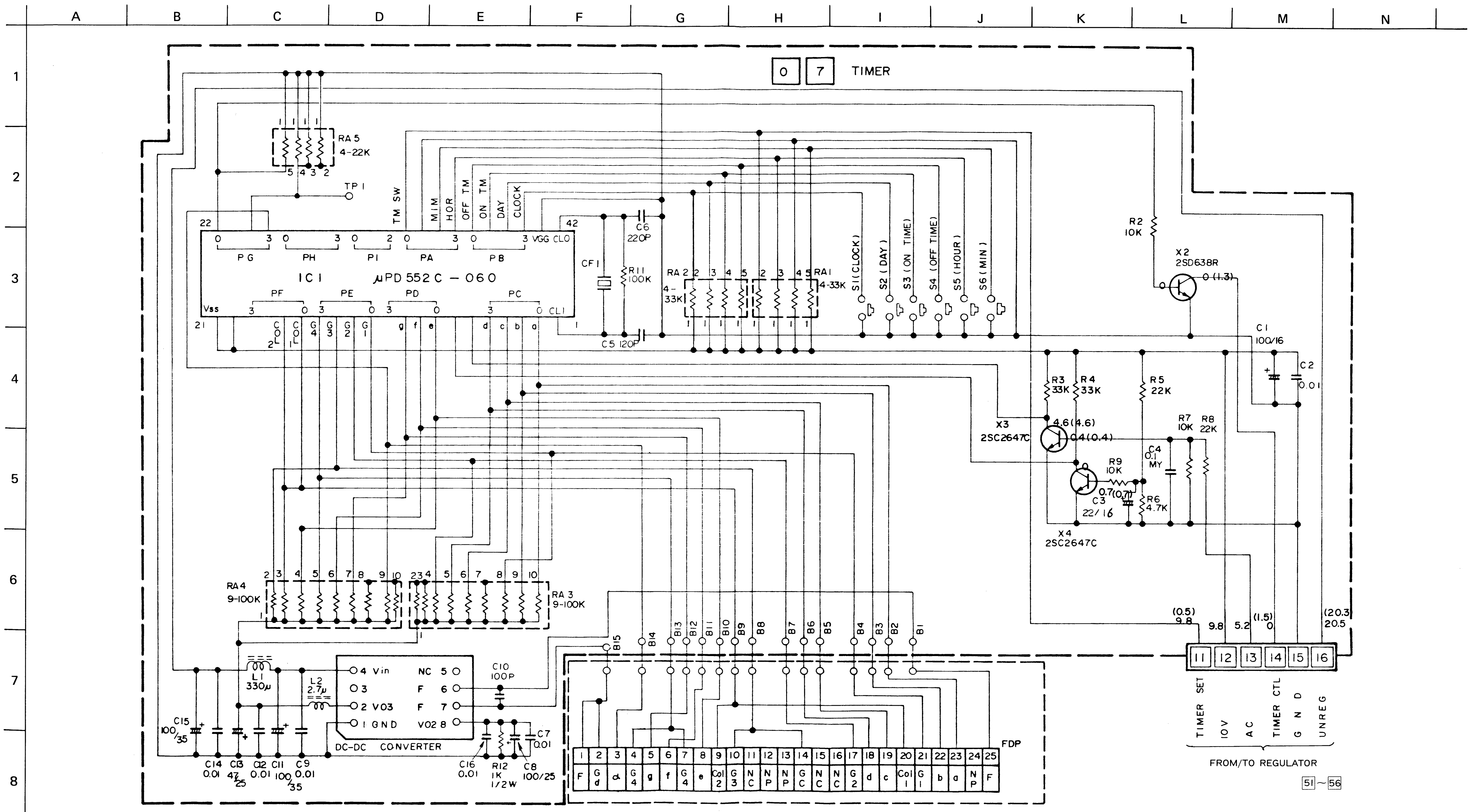
— 09 POWER SUB CIRCUIT BOARD —


X102
X103
B
C
E
22
25
23
21
24
B C E
113
112
111

— 10 POWER SUB CIRCUIT BOARD —


R101
R102
R103
1
2

5.17 TIMER SCHEMATIC DIAGRAM


A B C D E F G H I J K L M N
1 2 3 4 5 6 7 8 9
07 TIMER
RA 5 4-22K
TP 1
IC 1 μPD 552 C — 060
PG PH PI PA PB
PF PE PD PC
Vss VGG CLO CL1
TM SW
MIM
HOR
OFF TM
ON TM
DAY
CLOCK
C6 220P
CF 1
R11 100K
C5 120P
RA 2 4-33K
RA 1 4-33K
S1 (CLOCK)
S2 (DAY)
S3 (ON TIME)
S4 (OFF TIME)
S5 (HOUR)
S6 (MIN)
R2 10K
X2 2SD638R
0 (1.3)
C1 100/16
C2 0.01
R3 33K
R4 33K
R5 22K
X3 2SC2647C
4.6(4.6)
0.4(0.4)
R7 10K
R8 22K
C4 0.1 MY
R9 10K
0.7(0.7)
C3 22/16
R6 4.7K
X4 2SC2647C
RA 4 9-100K
RA 3 9-100K
B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1
(0.5) 9.8
9.8
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(1.5) 0
(20.3) 20.5
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L2 2.7μ
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C16 0.01
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C14 0.01
C13 47/25
C12 0.01
C11 100/35
C9 0.01
FDP
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
F Gd a G4 g f G4 e Col2 G3 NC NP NP GC NC G2 d c Col1 G1 b a NP F

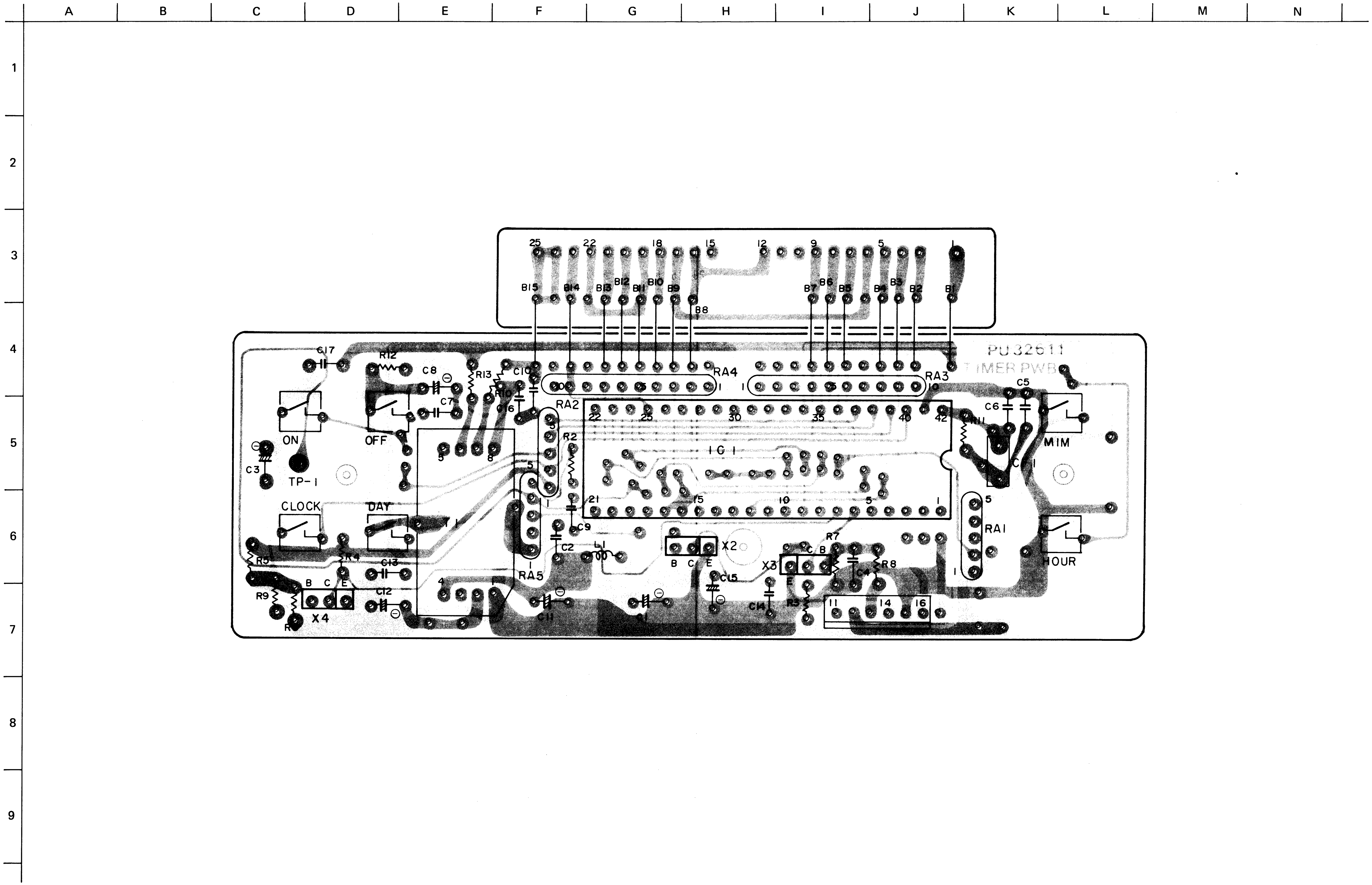
NOTE

1 Unless Otherwise specified;
2 All resistance values are in ohms, $\frac{1}{4}$ w 10%
3 All capacitance values are μF

ELECTROLYTIC
MYLAR
CERAMIC

4. Voltages are DC measured with a digital voltmeter.
5. Voltages in parenteses are with timer set (but recording not in progress).

5.18 TIMER CIRCUIT BOARD


A
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C3
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OFF
MIM
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HOUR
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R5
R4
R9
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E
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C12
C11
C15
C14
X2
X3
R7
C4
R8
R3
11
14
16

6.10 TU & IF ASS'Y . . . . PU49717A(EG)
PU49717B(EK)

Symbol No.	Part No.	Part Name	Description
IC 1	AN5111	Integrated Circuit	
IC 2	AN5732	″	
X 1	2SC2647C	Transistor	
X 2	″	″	
X 3	″	″	
X 4	2SD638R	″	
X 5	2SD637R	″	
X 6	″	″	
X 7	2SB644RS	″	
X 8	2SD637R	″	
X 9	″	″	
D 1	RD9.1EB3	Zener Diode	
D 2	MA150	Diode (EG only)	
D 3	″	″	
D 4	″	″	
D 5	″	″	
R 1	QRD187J-152	CR	1.5 K 1/8 W, J
R 2	″ -222	″	2.2 K ″ ″
R 3	″ -104	″	100 K ″ ″
R 4	″ -183	″	18 K ″ ″
R 5	″ -122	″	1.2 K ″ ″
R 6	″ -152	″	1.5 K ″ ″
R 7	QVP4A0B-472	VR	4.7 K
R 8	QRD187J-221	CR (EG)	220 1/8W, J
	″ -101	″ (EK)	100 ″ ″
R 9	″ -271	″ (EG)	270 ″ ″
	″ -331	″ (EK)	330 ″ ″
R10	″ -182	″	1.8 K ″ ″
R11	″ -332	″	3.3 K ″ ″
R12	″ -332	″	3.3 K ″ ″
R13	″ -221	″	220 ″ ″
R14	″ -391	″	390 ″ ″
R15	″ -472	″	4.7 K ″ ″
R16	″ -102	″	1 K ″ ″
R17	″ -273	″	27 K ″ ″
R18	″ -561	″	560 ″ ″
R19	″ -274	″	270 K ″ ″
R20	″ -471	″ (EK only)	470 ″ ″
R21	″ -222	″	2.2 K ″ ″
R22	QVP4A0B-682	VR	6.8 K
R23	QRD187J-473	CR	47 K 1/8W, J
R24	″ -123	″	12 K ″ ″
R25	″ -332	″	3.3 K ″ ″
R26	–	–	
R27	QVP4A0B-222	VR	2.2 K
R28	QRD187J-561	CR	560 1/8W, J
R29	″ -332	″	3.3 K ″ ″
R30	–	–	
R31	QRD187J-273	CR	27 K 1/8W, J
R32	″ -272	″ (EG)	2.7 K ″ ″
	″ -152	″ (EK)	1.5 K ″ ″
R33	QVP4A0B-682	VR	6.8 K
R34	QRD187J-153	CR	15 K 1/8W, J
R35	″ -153	″	15 K ″ ″
R36	″ -272	″	2.7 K ″ ″
R37	″ -561	″	560 ″ ″
R38	″ -271	″	270 ″ ″
R39	″ -750	″	75 ″ ″
R40	–	–	
⚠R41	QRZ0054-220-BS	Fusible Resistor	22
⚠R42	″ -330-BS	″	33
R43	QRD187J-472	CR	4.7 K 1/8W, J
R44	QVP4A0B-103	VR	10 K
R45	QRD187J-563	CR	56 K 1/8W, J
R46	″ -333	″	33 K ″ ″
R47	″ -563	″	56 K ″ ″
R48	″ -562	″	5.6 K ″ ″
R49	″ -224	″	220 K ″ ″
R50	–	–	
R51	–	–	
R52	QRD187J-332	CR	3.3 K 1/8W, J
R53	″ -332	″	3.3 K ″ ″
R54	″ -122	″	1.2 K ″ ″
R55	″ -223	″	22 K ″ ″
R56	″ -102	″	1 K ″ ″
R57	″ -103	″	10 K ″ ″
R58	″ -103	″	10 K ″ ″
R59	″ -332	″	3.3 K ″ ″
R60	–	–	
R61	QRD187J-103	CR	10 K 1/8W, J
C 1	QCF31HP-222	C Cap	0.0022 50 V
C 2	″ -103	″	0.01 ″
C 3	QET61HR-474	E Cap	0.47 ″
C 4	QCF31HP-103	C Cap	0.01 ″
C 5	QCT25CH-3R0	″	3 P
C 6	″ -3R0	″ (EG)	3 P
	″ -2R0	″ (EK)	2 P
C 7	QCT25HH-680	″ (EG)	68 P
	″ -560	″ (EK)	56 P
C 8	QCS31HJ-470	″	47 P 50 V
C 9	QCF31HP-103	″	0.01 ″
C10	–	–	
C11	QCT25PH-560	C Cap	56 P
C12	QCT25CH-120	″	12 P
C13	QCT25RH-151	″	150 P
C14	QCT25CH-150	″	15 P
C15	QET61AR-476	E Cap	47 10 V
C16	QET61CR-106	″	10 16 V
C17	QCF31HP-103	C Cap	0.01 50 V
C18	QCF31HJ-470	″	47 P ″
C19	QFM31HK-473	MY Cap	0.047 ″
C20	QCT25CH-101	C Cap (EG only)	100 P
C21	QCF31HP-102	″	0.002 50 V
C22	QEE41VM-334	T Cap	0.33 35 V
C23	QEE41CM-685	″	6.8 16 V
C24	QET61ER-335	E Cap	3.3 25 V
C25	QCF31HP-103	C Cap	0.01 50 V
C26	QCS31HJ-220	″	22 P ″
C27	QET61AR-476	E Cap	47 10 V
C28	″ -476	″	47 ″
C29	QCS31HJ-221	C Cap	220 P 50 V
C30	–	–	
C31	QET61CR-106	E Cap	10 16 V
C32	QCS31HJ-220	C Cap	22 P 50 V
C33	QFM31HK-102	MY Cap	0.001 ″
C34	QET61AR-477	E Cap	470 10 V
C35	QET61CR-227	″	220 16 V
C36	QCF31HP-103	C Cap	0.01 50 V
C37	–	–	
C38	QCF31HP-222	C Cap	0.0022 50 V
C39	QFM31HK-473	MY Cap	0.047 ″

Symbol No.	Part No.	Part Name	Description
C40	–	–	
C41	QET61CR-106	E Cap	10 16 V
C42	QCF31HP-103	C Cap	0.01 50 V
C43	QCT25CH-120	"	12 P
C44	QFM31HK-183	MY Cap	0.018 50 V
C45	QET61HR-105	E Cap	1 "
C46	QET61CR-106	"	10 16 V
C47	QCF31HP-103	C Cap	0.01 50 V
C48	QET61HR-225	E Cap	2.2 "
C49	QET61ER-106	"	10 25 V
C50	–	–	
C51	QET61ER-106	E Cap (EG only)	10 25 V
C52	QET61HR-474	"	0.47 50 V
C53	" -105	"	1 "
C54	QCS31HJ-221	C Cap	220 P "
C55	QFM31HK-273	MY Cap	0.027 "
C56	QET61HR-474	E Cap	0.47 "
C57	" -225	"	2.2 "
C58	QET61CR-106	"	10 16 V
C59	QCF31HP-103	C Cap	0.01 50 V
C60	–	–	
C61	QET61HR-105	E Cap	1 50 V
HLB-1	PU49373	HLB Filter (EG)	
	PU49813-2	" (EK)	
CF-1	PU49295	Ceramic Filter (EG)	
	PU49814	" (EK)	
T 1	PU32176-2	Coil (EG)	
	" -3	" (EK)	
T 2	PU32167-4	"	
T 3	PU32177-3	"	
T 4	PU32178-2	" (EG)	
	" -3	" (EK)	
T 5	PU32179-2	" (EG)	
	" -3	" (EK)	
T 6	PU32180-2	" (EG)	
	" -3	" (EK)	
L 1	A04725-5.6	Peaking Coil	
L 2	" -100	"	
L 3	" -1.8	"	
L 4	" -39	"	
L 5	" -39	"	
P 1	PU43351-3	Cap Housing	
P 2	" -7	"	
P 3	" -5	"	
	PU32175-3	Tuner (EG)	
	PU32523	" (EK)	
	PU49816	Tuner Bracket	
	LPSP3004ZS	Screw	
	GPST3006ZS	Tapping Screw	
	PU45908-3	Test Pin	
	PU20816	Shield Case (1)	
	PU20817-1-4	" (2)	
	PU20818	" (3)	

6.7 TIMER CIRCUIT BOARD ASS'Y PU49389A

Symbol No.	Part No.	Part Name	Description
IC 1	UPD552C-060	Integrated Circuit	
X 1	–	–	
X 2	2SD638R	Transistor	
X 3	2SC2647C	″	
X 4	″	″	
RA 1	EXB-P84333M	Resistor Array	
RA 2	″	″	
RA 3	EXB-P89104M	″	
RA 4	″	″	
RA 5	EXB-P84223M	″	
R 1	–	–	
R 2	QRD143J-103	CR	10 K 1/4 W, J
R 3	″ -333	″	33 K ″ ″
R 4	QRD187J-333A	″	33 K 1/8 W, J
R 5	″ -223A	″	22 K ″ ″
R 6	″ -472A	″	4.7 K ″ ″
R 7	QRD143J-103	″	10 K 1/4 W, J
R 8	″ -223	″	22 K ″ ″
R 9	QRD187J-103A	″	10 K 1/8 W, J
R10	–	–	
R11	QRD143J-104	CR	100 K 1/4 W, J
R12	QRD123J-102	″	1 K 1/2 W, J
C 1	QET61CR-107	E Cap	100 16 V
C 2	QCF31HP-103	C Cap	0.01 50 V
C 3	QET61CR-226	E Cap	22 16 V
C 4	QFN41HK-104	MY Cap	0.1 50 V
C 5	QCS31HJ-121	C Cap	120 P ″
C 6	″ -221	″	220 P ″
C 7	QCF31HP-103	″	0.01 ″
C 8	QET61ER-107	E Cap	100 25 V
C 9	QCF31HP-103	C Cap	0.01 50 V
C10	QCS31HJ-101	″	100 P ″
C11	QET61VR-107	E Cap	100 35 V
C12	QCF31HP-103	C Cap	0.01 50 V
C13	QET61ER-476	E Cap	47 25 V
C14	QCF31HP-103	C Cap	0.01 50 V
C15	QET61VR-107	E Cap	100 35 V
C16	QCF31HP-103	C Cap	0.01 50 V
S 1	PU47034	Push Switch	CLOCK
S 2	″	″	DAY
S 3	″	″	START
S 4	″	″	STOP
S 5	″	″	HOUR/SERIAL
S 6	″	″	MIN/DAY
T 1	PU49340	Transformer	DC-DC Converter
TP1	A74138	Test Pin	
L 1	PU30284-45R	Choke Coil Ass'y	
L 2	PU50289-2R7	Peaking Coil	
CF1	PU50224	Ceramic Filter	
	QXT3100-010	Vinyl Tube	(For L2)
	QXT341H-015	″	(For R12)
	PU43351-6	Cap Housing	11–16
	PU49565	Fluorescent Display Panel	

6.8 PRE-SETTER CIRCUIT BOARD ASS'Y .... PU50107A(EG) PU50107B(EK)

Symbol No.	Part No.	Part Name	Description
D 1	MA162	Diode	
D 2	″	″	
D 3	″	″	
D 4	″	″	
D 5	″	″	
D 6	″	″	
D 7	″	″	
D 8	″	″	
D 9	″	″	
D10	″	″	
D11	″	″	
D12	″	″	
D13	″	″	D13—D24 for EG only
D14	″	″	
D15	″	″	
D16	″	″	
D17	″	″	
D18	″	″	
D19	″	″	
D20	″	″	
D21	″	″	
D22	″	″	
D23	″	″	
D24	″	″	
R 1	PU49290	Trimmer VR-A	20 K
R 2	PU49291	″ VR-B	20 K
R 3	PU49290	″ VR-A	20 K
R 4	PU49291	″ VR-B	20 K
R 5	PU49290	″ VR-A	20 K
R 6	PU49291	″ VR-B	20 K
R 7	PU49290	″ VR-A	20 K
R 8	PU49291	″ VR-B	20 K
R 9	PU49290	″ VR-A	20 K
R10	PU49291	″ VR-B	20 K
R11	PU49290	″ VR-A	20 K
R12	PU49291	″ VR-B	20 K
S 1	PU47960	Band Switch	S1–S12 for EG only
S 2	″	″	
S 3	″	″	
S 4	″	″	
S 5	″	″	
S 6	″	″	
S 7	″	″	
S 8	″	″	
S 9	″	″	
S10	″	″	
S11	″	″	
S12	″	″	
S13	QSM1S01-014	Microswitch	
	PU47707-7	Cap Housing	11–17, 21–27
	PU49921	Pre-set Cover	EG
	PU49920	″	EK
	SBSB2006Z	Tapping Screw	

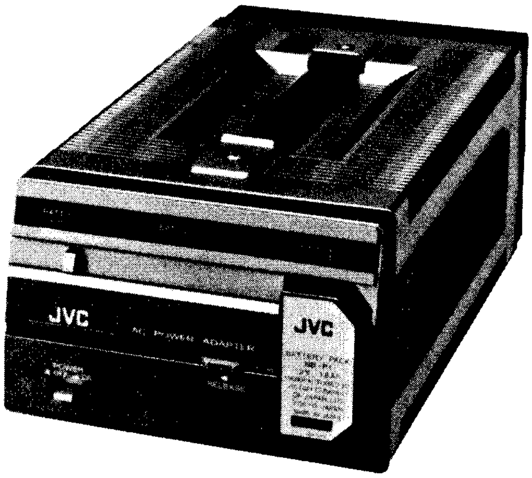
6.9 CHANNEL SELECT CIRCUIT PU50108A(EG) BOARD ASS'Y .... PU50108B(EK)

Symbol No.	Part No.	Part Name	Description
IC 1	UPC574J-KL	Integrated Circuit	
IC 2	UPC1363C	"	
X 1	2SD637R	Transistor	
X 2	"	"	
X 3	"	"	
X 4	–	–	
X 5	–	–	
X 6	2SC2647C	Transistor	
X 7	2SB644R	"	
X 8	2SD637R	"	X8–X10 for EG only
X 9	2SB643R	"	
X10	"	"	
X11	"	"	
X12	"	"	
X13	2SD889R	"	
X14	2SC2647C	"	
D 1	RD6.8EB	Zener Diode	
D 2	MA161	Diode	D2–D3 for EG only
D 3	"	"	
D 4	"	"	
D 5	–	–	
D 6	MA161	Diode	
R 1	–	–	
R 2	QRD187J-104	CR	100 K 1/8 W, J
R 3	" -822	"	8.2 K " "
R 4	" -334	"	330 K " "
R 5	" -103	"	10 K " "
R 6	" -222	"	2.2 K " "
R 7	" -471	"	470 " "
R 8	" -152	"	1.5 K " "
R 9	" -102	"	1 K " "
R10	QVP4A0B-102	VR	1 K
R11	QRD187J-102	CR	1 K 1/8 W, J
R12	" -223	"	22 K " "
R13	" -562	"	5.6 K " "
R14	" -223	"	22 K " "
R15	" -103	"	10 K " "
R16	" -103	"	10 K " "
R17	" -393	" R17–R23 for EG only	39 K " "
R18	" -563	"	56 K " "
R19	" -103	"	10 K " "
R20	" -183	"	18 K " "
R21	" -182	"	1.8 K " "
R22	" -103	"	10 K " "
R23	" -103	"	10 K " "
R24	" -154	"	150 K " "
R25	" -124	"	120 K " "
R26	" -153	"	15 K " "
R27	" -104	"	100 K " "
R28	" -124	"	120 K " "
R29	" -104	"	100 K " "
R30	" -152	"	1.5 K " "
R31	" -223	"	22 K " "
R32	" -103	"	10 K " "
R33	" -273	"	27 K " "
R34	" -103	"	10 K " "
R35	" -102	"	1 K " "
R36	" -683	"	68 K " "
R37	" -153	"	15 K " "
R38	" -153	"	15 K " "

Symbol No.	Part No.	Part Name	Description
⚠R39	QRZ0054-560-BS	FR	56
R40	–	–	
R41	–	–	
R42	–	–	
R43	–	–	
R44	QRG019J-122S	OMR	1.2 K 1 W, J
R45	QRD187J-822	CR	8.2 K 1/8 W, "
C 1	QET41HR-106M	E Cap	10 50 V
C 2	" -474	"	0.47 "
C 3	QET41ER-476	"	47 25 V
C 4	QET41AR-476	"	47 10 V
C 5	QFM31HK-103	MY Cap	0.01 50 V
C 6	QET41CR-336	E Cap	33 16 V
C 7	QET41ER-107	"	100 25 V
C 8	QFM31HK-104	MY Cap	0.1 50 V
C 9	QET41CR-106	E Cap	10 16 V
C10	QFM31HK-103	MY Cap	0.01 50 V
C11	" -223	"	0.022 "
C12	" -223	"	0.022 "
C13	" -223	"	0.022 "
C14	QET41CR-476	E Cap	47 16 V
C15	–	–	
C16	–	–	
C17	–	–	
C18	–	–	
C19	QET41JR-476	E Cap	47 63 V
C20	QET41ER-227	"	220 25 V
	PU43351-4	Cap Housing	11–14
	" -3	"	21–23
	" -3Y	"	31–33
	" -7	"	71–77
	" -3R	"	81–83
	" -2Y	"	101–102
	PU32273	Presetter Bracket	
	DPSP3006ZS	Screw	

No. 8187 ($^3/_3$)

JVC Service Manual


JVC
AC POWER ADAPTER
JVC
BATTERY PACK
POWER
RELEASE

VICTOR COMPANY OF JAPAN, LIMITED

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SECTION 1
GENERAL DESCRIPTION

This manual provides service information for the JVC AC Power Adapter Model AA-P22E.
Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.
For convenience, the text of the Instructions is reproduced on the following pages. Numbering of the pages also corresponds to the Instructions.
However, the Instructions used by the customers are in English, French and German versions. The following is a reprint of only the English version.

Thank you for purchasing the JVC AA-P22EG/EK AC Power Adapter. This unit provides DC power for the JVC HR-2200EG/EK Portable Video Cassette Recorder from a household AC outlet. It can also be used to recharge the NB-P1 Battery Pack, which is for exclusive use with the HR-2200EG/EK.
Before using the AA-P22EG/EK, read this instruction booklet carefully for obtaining the best results.

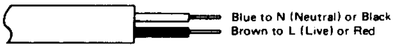
WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

Note: The rating plate is on the rear of this unit.

IMPORTANT (In the United Kingdom)
Mains Supply (AC 240 V∿, 50 Hz only)

IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:



If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal coded L (Live) or coloured Red.
If in doubt — consult a competent electrician.

Note
This equipment should be disconnected from the mains when not in use.

CAUTION

To prevent electric shock, do not open the cabinet. No user serviceable parts inside. Refer servicing to qualified service personnel.

POWER SYSTEM

Connection to the mains supply
The operating voltage of this set is preset to 220 V∿ (EK-version: 240 V∿) at the factory.
Before connecting to mains, check that the voltage selector on the rear panel is set to the same voltage as your local mains supply.

Adapting to local power line
This set operates on either 110, 127, 220 or 240 V∿.
If the preset voltage is different from the power line voltage in your area, reset the voltage selector by inserting a screwdriver into the slot of the voltage selector and turning it until the correct voltage is displayed.

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Providing power for the HR-2200EG/EK portable video cassette recorder 6
Recharging the NB-P1 battery pack 7
Cautions regarding the battery pack and recharging 8
Specifications 9

PRECAUTIONS

- The AA-P22EG/EK is used exclusively with the JVC HR-2200EG/EK portable video cassette recorder and cannot be employed for other video recorders.
- Be careful not to block the ventilation openings, as heat is generated inside the unit.
- Do not allow inflammables, water or metallic objects to enter the unit, as this will cause damage or malfunctioning.
- Do not insert any object other than the JVC NB-P1 battery pack into the battery compartment, as this will cause damage or malfunctioning.
- Never remodel the unit or use it when its cabinet is removed.
- Do not damage or alter the power cord as it may cause electric shocks or short circuits.
- Avoid violent shocks and rough handling of the unit.
- When turning the power supply of the unit off, first set the video cassette recorder to the Stop mode.
- Do not allow any foreign objects into the battery compartment of the unit.
- Avoid using the unit under the following conditions:
  - Direct sunlight or places of extremely high temperature, such as near a heater
  - Places subject to high humidity
  - Places subject to vibrations

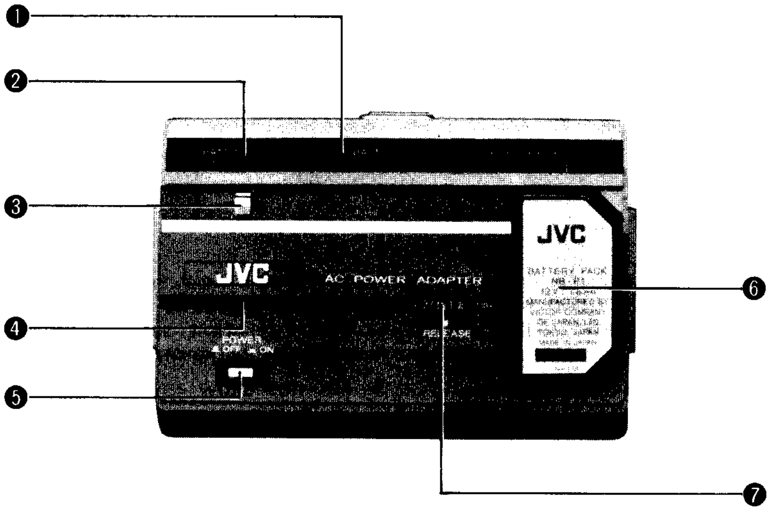
If malfunctioning occurs, stop using the unit immediately, unplug the power cord and consult your local JVC dealer.

FEATURES

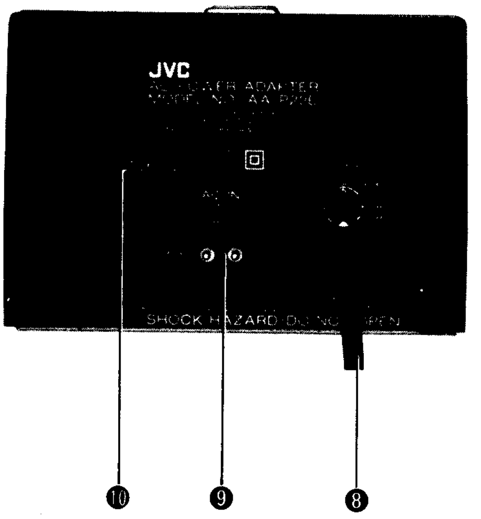
- Powers the JVC HR-2200EG/EK portable video cassette recorder from an AC household outlet.
- Recharges the NB-P1 battery pack (optional).
- Can recharge two NB-P1 battery packs in series; first the one installed in the recorder and then, automatically, the other installed in this adapter.
- Powers the moisture condensation preventive circuit built into the HR-2200EG/EK portable video cassette recorder.

CONTROLS AND CONNECTORS

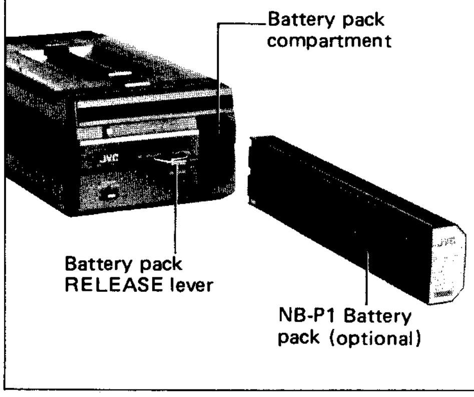
Front panel


❶
❷
❸
❹
❺
❻
❼
JVC
AC POWER ADAPTER
POWER
OFF ON
RELEASE
JVC
BATTERY PACK

Rear panel


JVC
SHOCK HAZARD DO NOT OPEN
❿
❾
❽

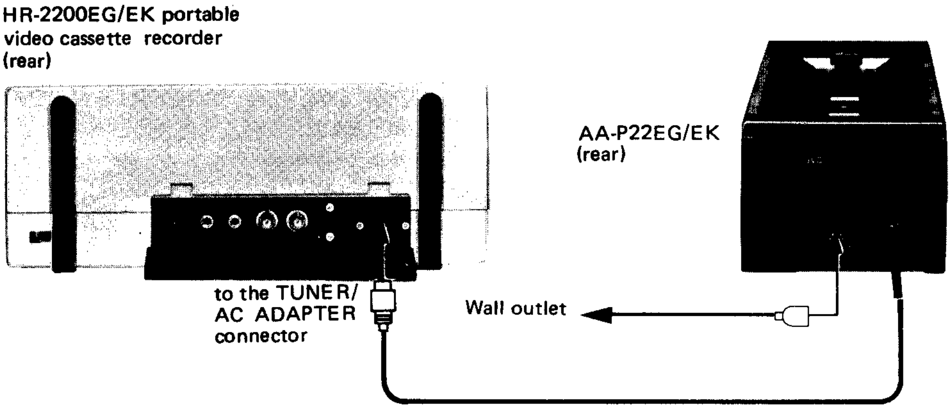
1. **BATT-2 indicator**
   Remains lighted while recharging the NB-P1 battery pack inserted in the compartment of the AA-P22EG/EK.
   Upon completion of recharging, it goes out.
2. **BATT-1 indicator**
   Remains lighted while recharging the NB-P1 battery pack inserted in the HR-2200EG/EK portable video cassette recorder.
   Upon completion of recharging, it goes out.
3. **CHARGE START button**
   Press to start recharging the battery pack.
4. **Power indicator**
   Lights when the power is ON and goes out when the power is OFF.
5. **POWER button**
   Press to turn the power ON (▬). Press again (▄) to turn power OFF.
6. **Battery pack compartment**
   Insert a battery pack for recharging.
7. **Battery pack RELEASE lever**
   Slide to the left to remove the battery pack.
8. **DC output cord**
   Connect to the TUNER/AC ADAPTER connector of the recorder.
9. **AC input connector (AC∿ IN)**
10. **Voltage selector**
    Set to the power supply voltage in your area. (See "POWER SYSTEM" on page 1.)

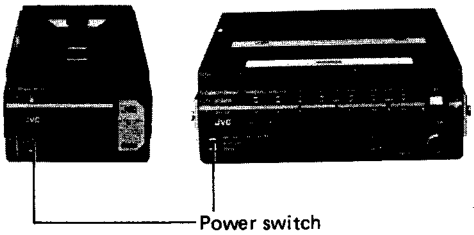


Inserting and removing of the NB-P1 battery pack
- Remove the cover of the compartment.
- Insert the NB-P1 battery pack into the compartment completely, making sure it locks in place.

Removing
- Slide the battery pack RELEASE lever to the left.

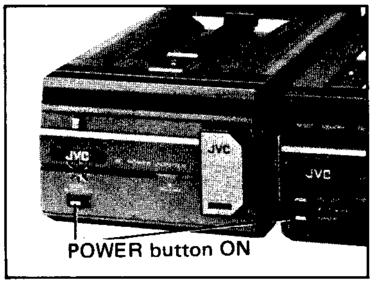
CONNECTIONS


HR-2200EG/EK portable
video cassette recorder
(rear)
AA-P22EG/EK
(rear)
to the TUNER/
AC ADAPTER
connector
Wall outlet

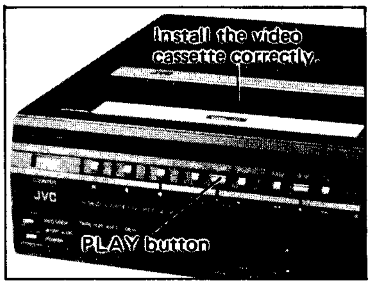

Power switch

Note
Before connecting, set the power switches of both the AA-P22EG/EK and the HR-2200EG/EK to OFF.

PROVIDING POWER FOR THE HR-2200EG/EK PORTABLE VIDEO CASSETTE RECORDER

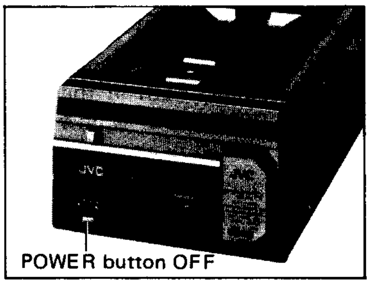


- Connect correctly following the illustration on the previous page.
- Set the POWER buttons of both the AA-P22EG/EK and the HR-2200EG/EK to the ON position. (The power indicator of the AA-P22EG/EK will light up.) Preparation is now completed.



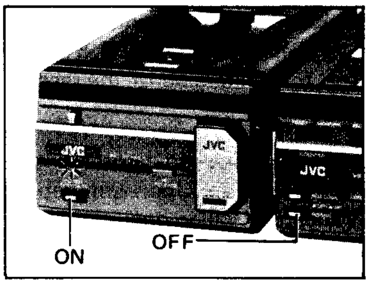
When playing back pre-recorded video tapes

1. Insert the video cassette into the HR-2200EG/EK and press the PLAY button.



When the HR-2200EG/EK is not in use

- Set the POWER button to OFF.



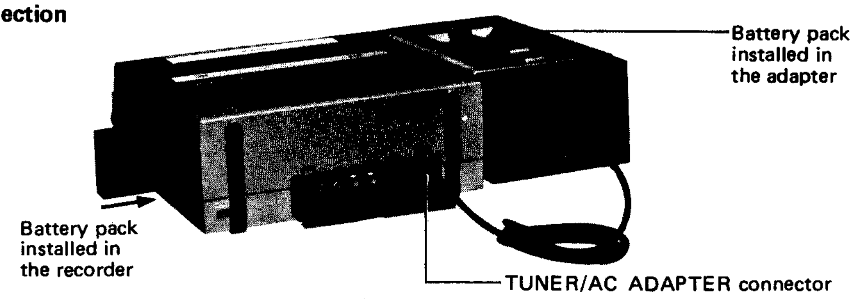
To prevent moisture condensation

If the POWER button of this unit is set to ON with the POWER button of the HR-2200EG/EK set to OFF, the moisture condensation prevention heater inside the HR-2200EG/EK is powered. However, if for some reason you are not using the HR-2200EG/EK for a long period of time, it is advisable to remove the power cord of the AA-P22EG/EK from the AC outlet.

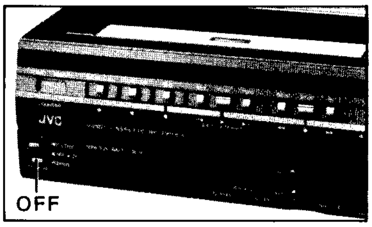
RECHARGING THE NB-P1 BATTERY PACK

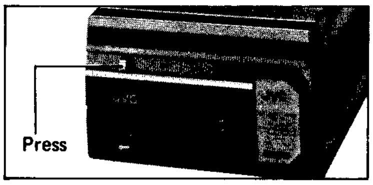
The AA-P22EG/EK can recharge two battery packs in series. First the battery pack installed in the video recorder is recharged and then, automatically, the battery pack installed in the adapter itself is recharged.

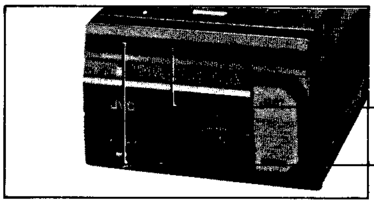
- **Connection**


Battery pack installed in the adapter
Battery pack installed in the recorder
TUNER/AC ADAPTER connector

Stop button
ON







1. Insert the battery packs correctly into both the recorder and the adapter.
2. Press the POWER buttons of the AA-P22EG/EK and the recorder to ON (▬) and set the recorder to the Stop mode.
3. Press the POWER button of the recorder to OFF. (The battery pack cannot be recharged unless the recorder's POWER button is set to OFF).
4. Press the CHARGE START button of the adapter. (Recharging the battery packs, both in the HR-2200EG/EK and the AA-P22EG/EK, is now possible.)
   - If you have already begun recharging one battery pack and later install another battery pack, in either the HR-2200EG/EK or the AA-P22EG/EK, continuous recharging for the later installed battery pack will not be performed. When the first battery pack has been recharged, it is necessary to press the CHARGE START button once again for recharging of the second battery pack to begin.
5. During recharging, the charging indicators for the respective battery packs light up. Upon completion of recharging, the indicators will go out.

Indicates the charging condition of the battery pack inside the AA-P22EG/EK.

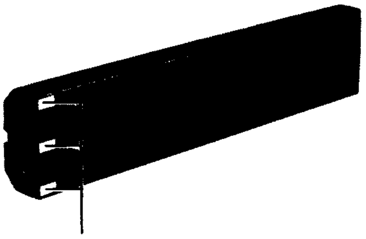
Indicates the charging condition of the battery pack inside the HR-2200EG/EK.

CAUTIONS REGARDING THE BATTERY PACK AND RECHARGING

The NB-P1 is a nickel-cadmium (Ni-Cd) battery. Give attention to the following to make the most of its characteristics.

- Before use, fully recharge the battery pack.
- Even when you are not using the battery pack, it will gradually discharge of itself. This natural discharging is accelerated as the ambient temperature rises.

  Therefore, it is recommended that you store the battery pack at a place of low temperatures.
- Do not discard the battery pack into fire nor leave it continuously exposed to high temperatures.
- The battery may not be 100 % rechargeable immediately after its natural discharge, since it has been inactivated. Repeat the recharge/discharge procedures two to three times in such a case, so as to restore the full efficiency of the battery.
- The battery pack has its own service life. If its operating time becomes exceedingly short even though you recharge it correctly, it means that the battery pack is nearing the end of its service life. Replace with a fresh one in such cases.
- Do not disassemble or remodel the battery pack.



Terminals
Do not short-circuit

- **Do not short-circuit the terminals**
  If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe with a piece of soft cloth.

- The average recharging time takes about 90 minutes per battery pack.
  When recharging a battery pack inside the HR-2200EG/EK and one inside the AA-P22EG/EK at the same time, the recharging time takes about 180 minutes.

  (The recharging time is based on room temperature of 20° C with a power supply of 220 V (EG-version) or 240 V (EK-version). The lower the temperature, the longer the recharging time.)

Temperature ranges:	
For recharging:	10° C to 35° C
For operating:	-10° C to 40° C
For storing:	-10° C to 30° C

SPECIFICATIONS

Power requirement : 110/127/220/240 V∿, 50/60 Hz
Power consumption : 70 watts
Rated output voltage : 12 V ⎓ DC
Rated output current : 1.8 A
Dimensions : 15.0(W) x 10.3(H) x 30.4(D) cm
Weight : 3.6 kg

Provided accessory : Power cord

Design and specifications subject to change without notice.

SECTION 2
DISASSEMBLY

2.1 CHASSIS REMOVAL

1. Take out the two screws ① and two screws ② as shown in Fig. 2-1, then slide the top cover rearward to remove.

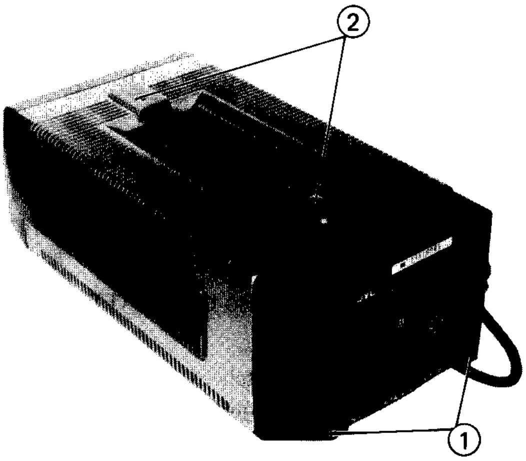


Fig. 2-1

2. Take out the four screws ③ of the four feet and one screw ④ with a plain washer, then remove the bottom cover.

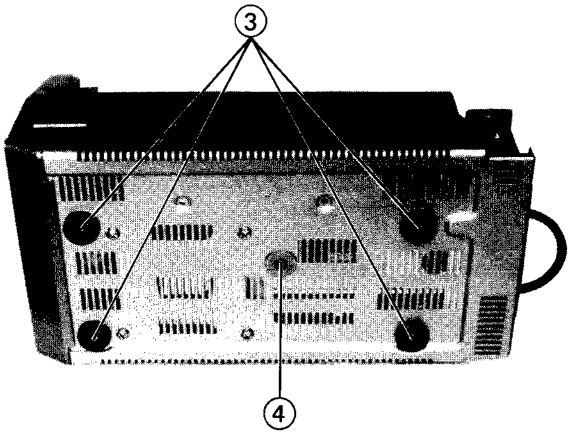


Fig. 2-2

3. Loosen two screws ⑤ located at the lower left and right portions of the front cover. Disengage two hooks ⑥ and remove the front cover.

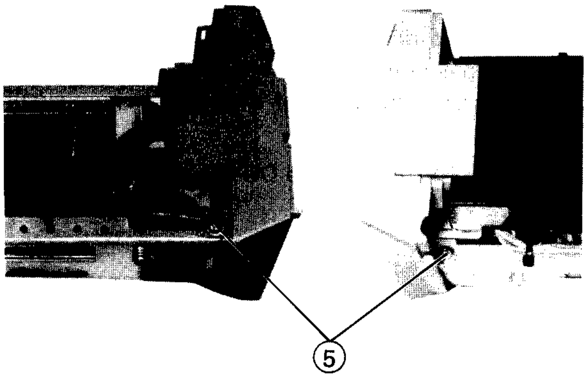


Fig. 2-3 (a)

Fig. 2-3 (b)

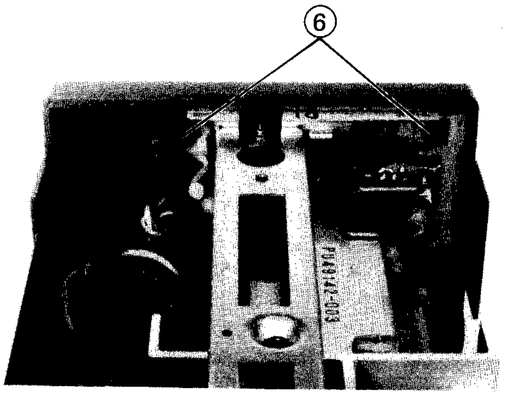
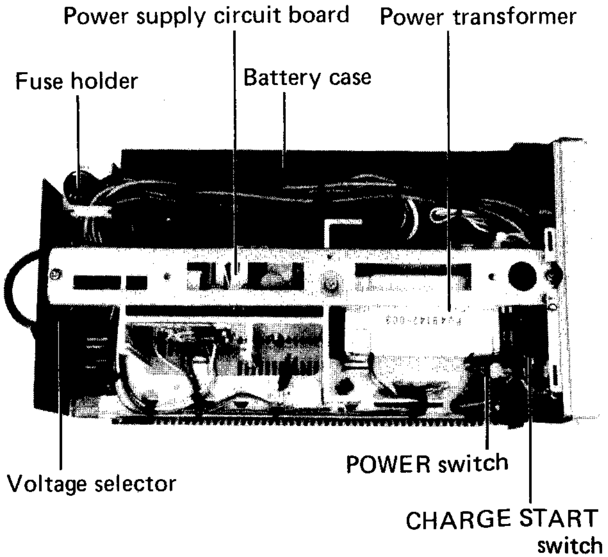


Fig. 2-3 (c)

2.2 MAIN PARTS LOCATION



Power supply circuit board
Power transformer
Fuse holder
Battery case
Voltage selector
POWER switch
CHARGE START switch

Fig. 2-4

SECTION 3
ADJUSTMENTS

3.1 ADJUSTMENT OF 12 V DC

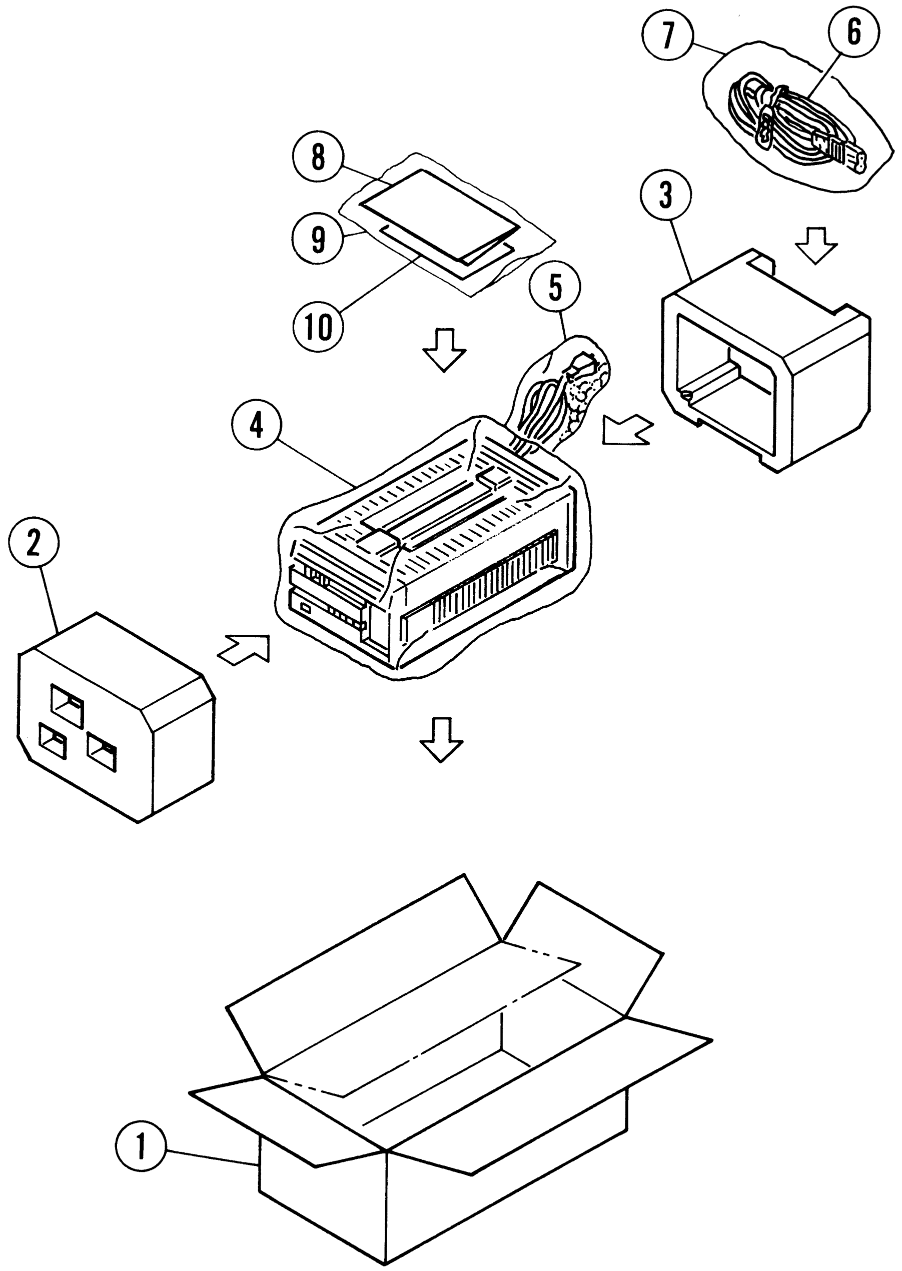
1. Disconnect the DC power output connector from the HR-2200E.
2. Connect a digital voltmeter or a DC voltmeter to the 6-pin terminal of the DC power output connector or terminal 63 of the power supply circuit board.
3. Adjust R12 to obtain a DC output voltage of 12.3 ± 0.2 V.

3.2 CONFIRMATION OF BATTERY CHARGING VOLTAGE

1. Insert uncharged battery pack NB-P1 into HR-2200E.
2. Turn off the POWER switch of the HR-2200E.
3. Connect the DC power output connector to the HR-2200E.
4. Connect a digital voltmeter or a DC voltmeter to terminal 64.
5. Turn on the POWER switch and press the CHARGE START switch.
6. Confirm that the DC output voltage is more than 16 V.
7. At this time, confirm also that "BATT-1" LED of the front panel lights.
8. When the POWER switch of HR-2200E is turned on, confirm that charging operation is not performed.
9. Confirm that the voltage at terminal 64 is 12 V DC and LED extinguishes when the battery is removed from the HR-2200E.
10. Insert the battery into the AA-P22E and press the CHARGE START switch.
11. Confirm that the DC voltage is more than 17 V at terminal 41 and the "BATT-2" LED lights.

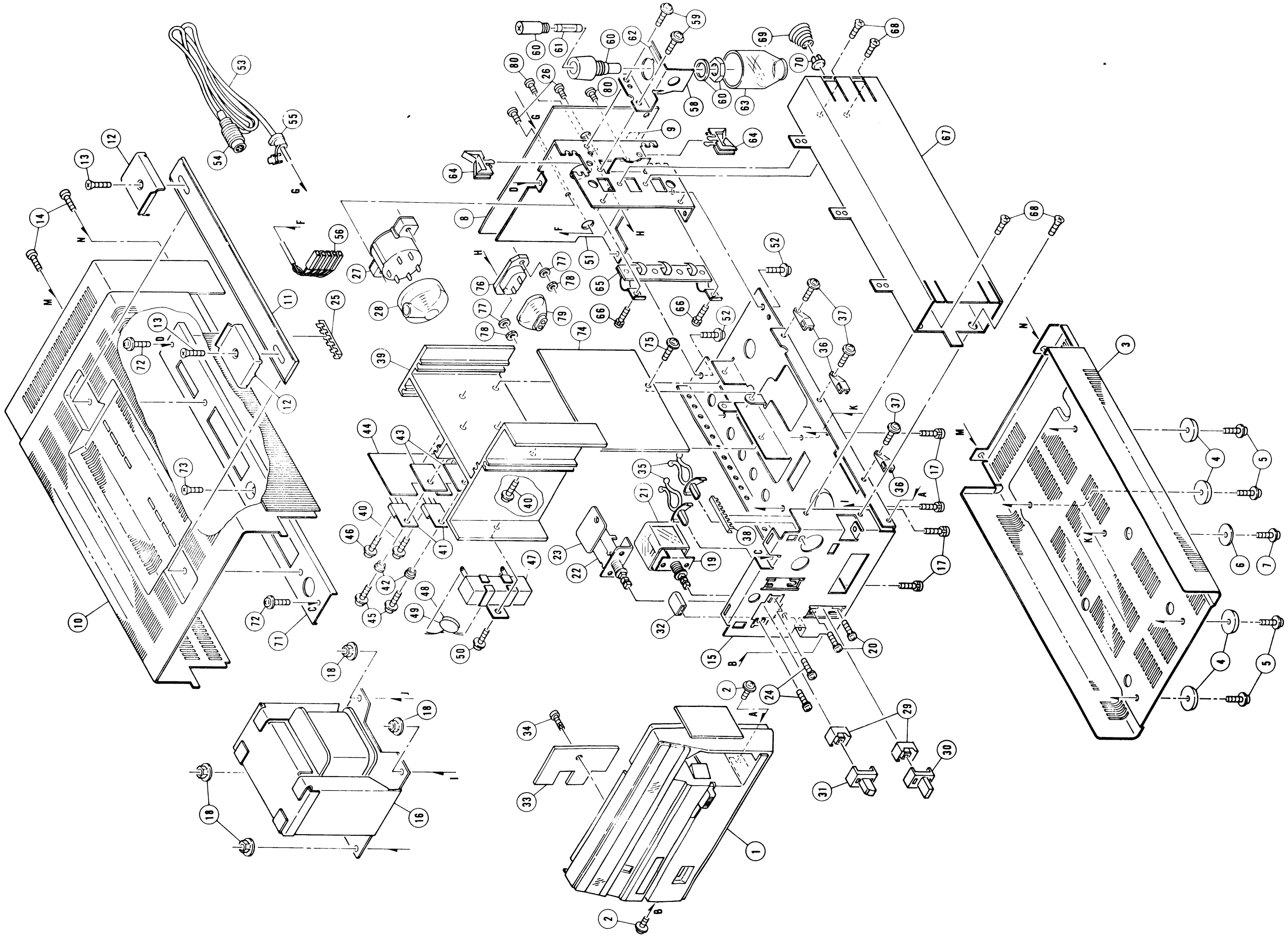
SECTION 4
EXPLODED VIEWS AND PARTS LIST

4.1 PACKING ASSEMBLY



Symbol No.	Part No.	Part Name	Description	Q'ty
	PUP30462-C	Packing Case Ass'y	EG Incl. (1) – (3)	1
	" -D	"	EK Incl. (1) – (3)	1
1	PUP30462-5	Packing Case	EG	1
	" -6	"	EK	1
2	PUP30463	Front Cushion		1
3	PUP30464	Rear Cushion		1
4	QPGA045-03005	Poly Bag		1
5	PUP40003-7	Air Cap		1
⚠ 6	QMP3950-183	Power Cord Set	EG Accessary	1
⚠	PU46128-BS	"	EK	1
7	GK34138-6	Poly Bag		1
8	PU30425-338	Instruction Book		1
9	QPGA020-03005	Poly Bag		1
10	PU32004	Guarantee Card	Only EK	1

4.2 CABINET AND CHASSIS ASSEMBLY


59
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12
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67
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56
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68
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76
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78
11
25
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79
66
66
M
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78
74
37
36
13
72
D
12
39
75
52
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37
K
K
A
17
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4
5
44
43
35
73
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40
41
46
21
38
36
6
7
23
19
C
22
17
47
42
45
48
49
32
15
20
72
C1
71
50
10
B
18
J
2
24
4
5
18
A
29
34
I
I
33
30
31
18
16
1
2
B

AA-14

*Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU21040D	Front cover ass'y	EG	1
	″ A	″	EK	1
2	GPST3008ZS	Tapping screw		2
3	PU20948	Bottom cover		1
4	PU49205	Foot		4
5	GPST3008ZS	Tapping screw		4
6	Q03091-104	Washer		1
7	GPST3008ZS	Tapping screw		1
⚠ 8	PU49840-1	Connector panel	EG	1
	″ -3	″	EK	1
9	PU47062	Serial No. plate		1
10	PU10274	Top cover		1
11	PU46361-2	Handle		1
12	PU46385-3	Handle cover		2
13	SHBP4016RS	Screw		2
14	SDST3008MS	Tapping screw		2
15	PU20947	Chassis		1
⚠ 16	PU49142-003-BS	Power transformer		1
17	SPSP4008ZS	Screw		4
18	NFS4000ZS	Nut		4
⚠ 19	QSP2111-011-BS	Push switch	POWER	1
20	SBST3006ZS	Tapping screw		2
⚠ 21	PU49885	Switch cover		1
22	PU49357	Push Switch	BATT. CHARGE	1
23	PU49629	Switch P.W.B.	03	1
24	SBST3006ZS	Tapping screw		2
⚠ 25	PU43172-9-35	Edge cover		1
⚠ 26	SPBP3008MS	Tapping screw		2
⚠ 27	QSR0085-002-BS	Voltage selector		1
⚠ 28	PU50317	Voltage selector cover		1
29	PU49202	Flexible ring		2
30	PU49180	Push button	for (19)	1
31	PU49888	″	for (22)	1
⚠ 32	PU49886	Edge cap		1
33	–	LED P.W.B. ass'y	See Sec. 6.2	1
34	SBSB3008Z	Tapping screw		1
⚠ 35	PU47879	Lead clamper		2
⚠ 36	PU43981	Holder		3
37	GPST3006ZS	Tapping screw		3
⚠ 38	PU43172-9-20	Edge cover		1
39	PU32501	Radiator		1
40	GPST3006ZS	Tapping screw	for (39)	2
41	2SC2484P	Transistor		2
42	PU41624-6	Insulation washer		2
43	PU45375-4	Spacer		2
44	PU49631	Power transistor P.W.B.	02	1
45	SBST3006ZS	Tapping screw		2
46	GPST3006ZS	″	for (44)	1
⚠ 47	PU49350-3R3	Unflammable resistor	R101	1
48	PU49254-2R2	Posistor	R102	1
49	PU49254-3R3	″	R103	1
50	GPST3006ZS	Tapping screw	for (47)	1

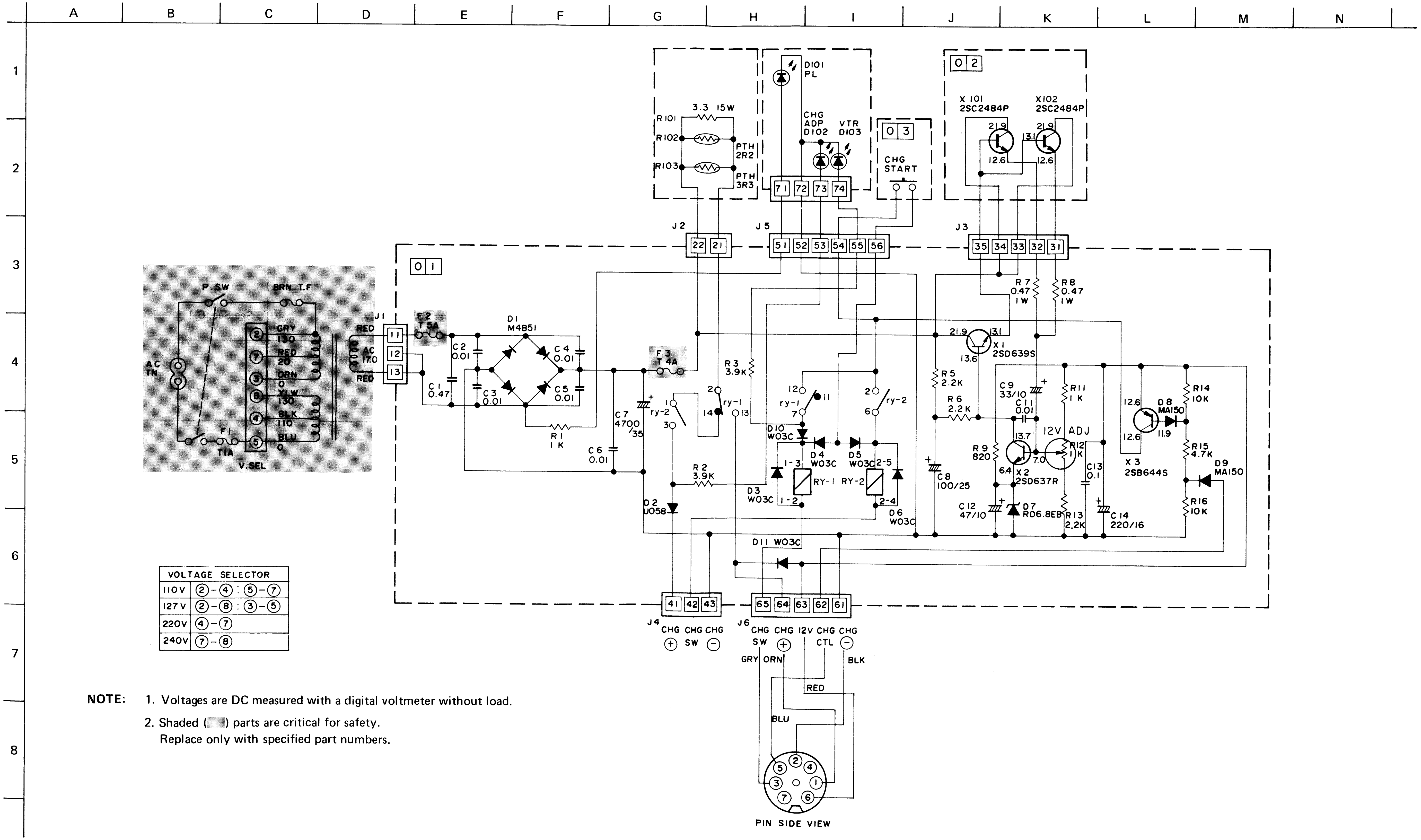
*Symbol No.	Part No.	Part Name	Description	Q'ty
51	PU32641	Bracket		1
52	GPST3006ZS	Tapping screw		2
53	PU49252B	DC cord	Incl. (54)	1
54	PU49375	7 pin plug		1
55	QHS6374-162	Cord stopper		1
56	A75801-5	Mini housing		1
57	–	–		–
58	PU49184	Fuse bracket		1
59	GPST3006ZS	Tapping screw		2
⚠ 60	QMG0301-003-BS	Fuse holder		1
⚠ 61	QMF51A2-IR0-BS	Fuse	F1, 1.0 A 250 V	1
⚠ 62	PU48571-4	Fuse sticker		1
⚠ 63	PU50316	Fuse cover		1
⚠ 64	PU46775	Edge cover		2
65	PU49203A-2	Terminal ass'y		1
66	SBST3006ZS	Tapping screw		2
67	PUS46265A	Battery case ass'y		1
68	SSST3008ZS	Tapping screw		4
69	PU49206	Corn spring		1
70	PU49958	Cap		1
71	PU32502	Stay		1
72	GPST3008ZS	Tapping screw		2
73	SSST3008ZS	″		1
74	–	Power P.W.B. ass'y	See Sec. 6.1	1
75	GPST3006ZS	Tapping screw		1
⚠ 76	QMC9017-001-BS	AC socket		1
77	WAS3000MS	Lock washer		2
78	NNS3000ZS	Nut		2
⚠ 79	PU50337	Inlet cover		1
⚠ 80	SPBP3008MS	Screw		2

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety.
Replace only with parts number specified.

SECTION 5
CHARTS AND DIAGRAMS

5.1 SCHEMATIC DIAGRAM


A
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7
8
P. SW
BRN T.F
AC IN
GRY 130
RED 20
ORN 0
YLW 130
BLK 110
BLU 0
F1 T1A
V. SEL
RED
AC 17.0
RED
J1
11
12
13
F2 T5A
C2 0.01
C1 0.47
C3 0.01
D1 M4B51
C4 0.01
C5 0.01
R1 1K
C6 0.01
C7 4700/35
F3 T4A
01
R101
3.3 15W
R102
R103
PTH 2R2
PTH 3R3
J2
22
21
D101 PL
CHG ADP D102
VTR D103
71
72
73
74
03
CHG START
J5
51
52
53
54
55
56
02
X101 2SC2484P
X102 2SC2484P
21.9
12.6
13.1
J3
35
34
33
32
31
R7 0.47 1W
R8 0.47 1W
R3 3.9K
ry-2
ry-1
D10 W03C
D4 W03C
D5 W03C
RY-1
RY-2
D3 W03C
D6 W03C
R2 3.9K
D2 U05B
D11 W03C
21.9
13.1
X1 2SD639S
13.6
R5 2.2K
R6 2.2K
C9 33/10
C11 0.01
R11 1K
12V ADJ
R12 1K
R9 820
13.7
7.0
6.4
X2 2SD637R
C8 100/25
C12 47/10
D7 RD6.8EB
R13 2.2K
C13 0.1
C14 220/16
12.6
D8 MA150
11.9
X3 2SB644S
R14 10K
R15 4.7K
D9 MA150
R16 10K
J4
41
42
43
CHG ⊕
CHG SW
CHG ⊖
J6
65
64
63
62
61
CHG SW
CHG ⊕
12V
CHG CTL
CHG ⊖
GRY
ORN
RED
BLK
BLU
PIN SIDE VIEW

VOLTAGE SELECTOR	
110V	②-④ : ⑤-⑦
127V	②-⑧ : ③-⑤
220V	④-⑦
240V	⑦-⑧

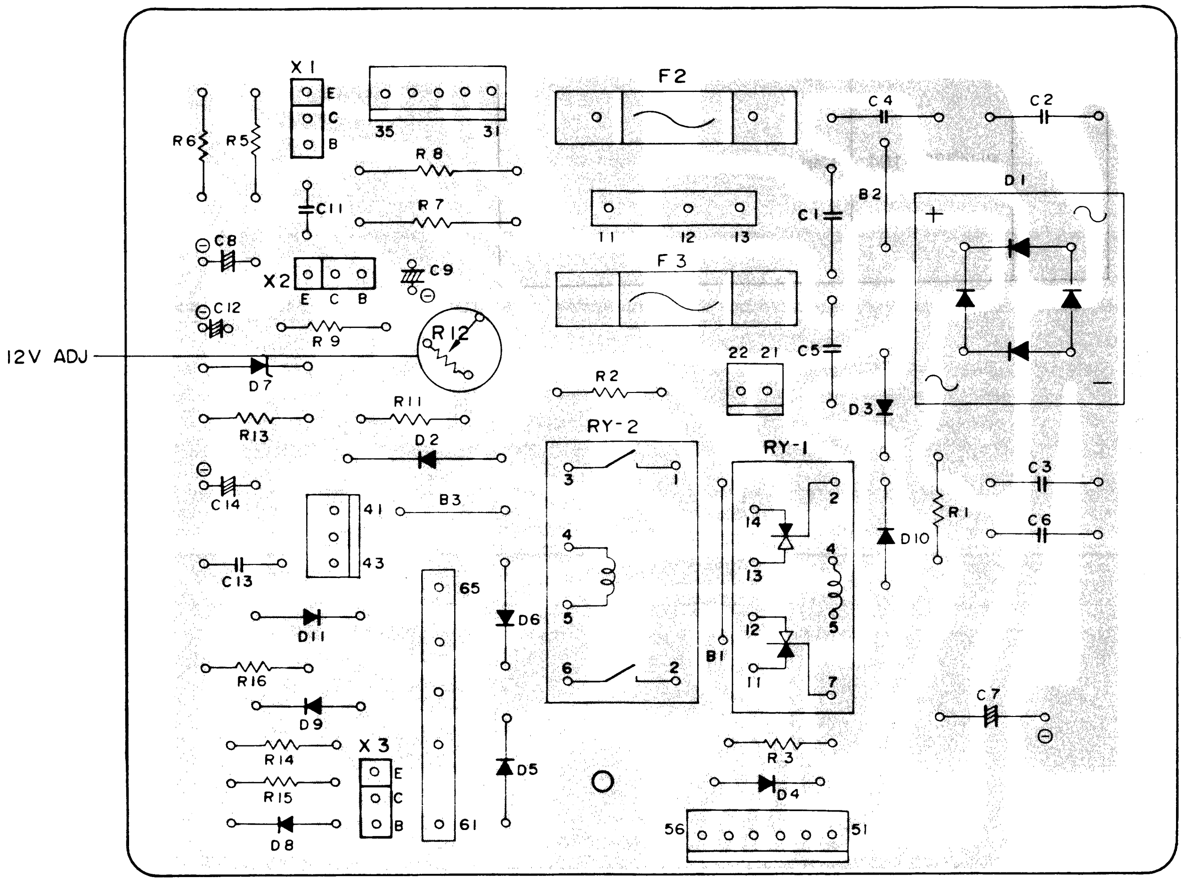
NOTE:
1. Voltages are DC measured with a digital voltmeter without load.
2. Shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.

5.2 CIRCUIT BOARDS

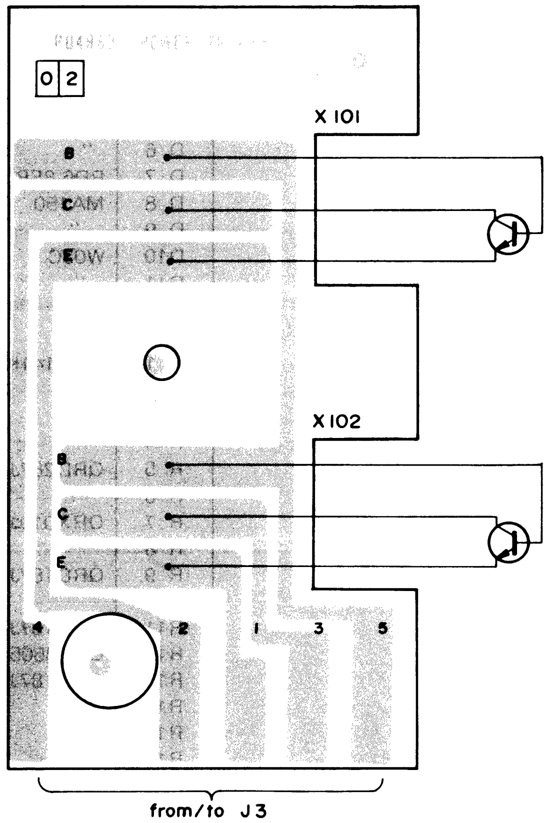
A B C D E F G H I J K L M N

1 2 3 4 5 6 7 8 9

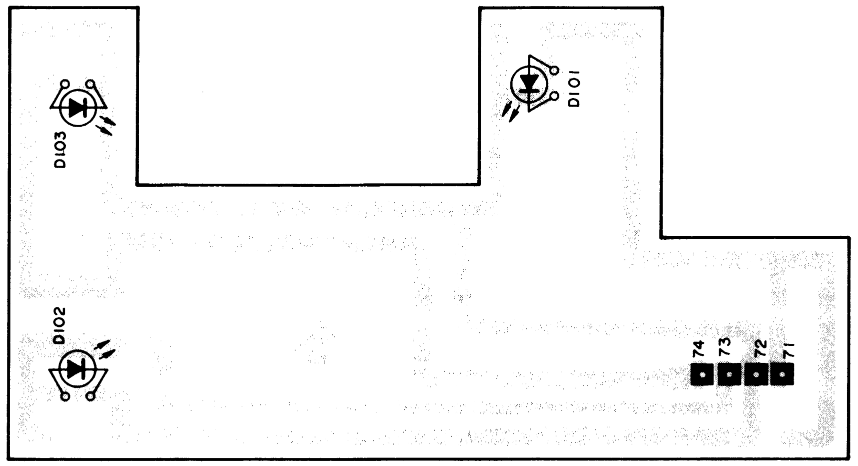
– POWER SUPPLY P.W.B. –


12V ADJ
X1
E
C
B
R6
R5
35
31
F2
C4
C2
R8
R7
C11
B2
D1
11
12
13
C1
C8
C12
X2
E C B
C9
F3
R9
R12
C5
22 21
D7
R2
R11
D3
R13
RY-2
RY-1
D2
C3
R1
C14
41
43
B3
3
1
2
14
4
13
C6
D10
C13
65
5
D6
D11
6
B1
12
R16
11
7
D9
C7
R14
X3
R3
R15
D5
D4
D8
61
56
51

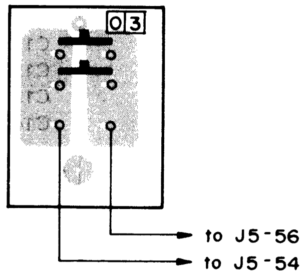
– POWER TR P.W.B. –


02
X101
X102
B
C
E
4
2
1
3
5
from/to J3

– LED P.W.B. –


D103
D101
D102
74
73
72
71

– SW P.W.B. –


03
to J5-56
to J5-54

SECTION 6
ELECTRICAL PARTS LIST

1. **SAFETY PRECAUTION**
   Parts identified by the ⚠ symbol are critical for safety.
   Replace only with specified part numbers.

2. Abbreviations in this list are as follows:

RESISTORS – All resistance values are in ohms (Ω).
K : 1 000
M : 1 000 000
CR : Carbon Resistor
Comp. R : Composition Resistor
WR : Wire Wound Resistor
OMR : Oxide Metal Film Resistor
VR : Variable Resistor (Potentiometer)
MFR : Metal Film Resistor
FR : Fusible Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.
P : μμF
C Cap : Ceramic Capacitor
E Cap : Electrolytic Capacitor
FM Cap : Film Mica Capacitor
MM Cap : Metalized Mylar Capacitor
MP Cap : Metalized Paper Capacitor
MY Cap : Mylar Capacitor
NP Cap : Non-polar Capacitor
PC Cap : Polycarbonate Capacitor
PP Cap : Poly Pro Capacitor
PS Cap : Polystyrol Capacitor
T Cap : Tantalum Capacitor
TR Cap : Trimmer Capacitor

Tolerances of resistors or capacitors are as follows:
M : ± 20%
K : ± 10%
J : ± 5%
G : ± 2%
F : ± 1%

6.1 POWER SUPPLY ASS'Y

PU49361C

Symbol No.	Part No.	Part Name	Description
X 1	2SD639S	Transistor	
X 2	2SD637R	"	
X 3	2SB644S	"	
D 1	M4B51-12	Diode	
D 2	U05B-F	"	
D 3	W03C	"	
D 4	"	"	
D 5	"	"	
D 6	"	"	
D 7	RD6.8EB	Zener Diode	
D 8	MA150	Diode	
D 9	"	"	
D10	W03C	"	
D11	"	"	
R 1	QRD141K-102	CR	1 K 1/4 W, K
R 2	" -392	"	3.9 K " "
R 3	" -392	"	3.9 K " "
R 4	–	–	
R 5	QRD287J-222	CR	2.2 K 1/8 W, J
R 6	" -222	"	2.2 K " "
R 7	QRX019J-R47	MFR	0.47 1 W, J
R 8	" -R47	"	0.47 " "
R 9	QRD187J-821	CR	820 1/8 W, J
R10	–	–	
R11	QRD187J-102	CR	1 K 1/8 W, J
R12	QVZ3505-102	VR	1 K
R13	QRD187J-222	CR	2.2 K 1/8 W, J
R14	" -103	"	10 K " "
R15	" -472	"	4.7 K " "
R16	" -103	"	10 K " "
C 1	QFH52AM-474	C. Cap	0.47 100V
C 2	QCF12HP -103	"	0.01 500V
C 3	" -103	"	0.01 "
C 4	" -103	"	0.01 "
C 5	" -103	"	0.01 "
C 6	" -103	"	0.01 "
C 7	QEV71VR-478	E. Cap	4700 35 V
C 8	QET41ER-107	"	100 25 V
C 9	QET41AR-336	"	33 10 V
C10	–	–	
C11	QFM31HK-103	MY Cap	0.01 50 V
C12	QET41AR-476	E Cap	47 10 V
C13	QFM31HK-104	MY Cap	0.1 50 V
C14	QET41CR-227	E Cap	220 16 V
⚠F 2	QMF51A2-5R0-BS		5A 250V
⚠F 3	" -4R0-BS		4A "
	E48965-002	Fuse Clip	
RY-1	PU49253-1	Relay	
RY-2	" -3	"	
J 1	A75802-3	Cap Housing	
J 2	PU43351-2	"	
J 3	" -5	"	
J 4	" -3	"	
J 5	" -6	"	
J 6	A75802-5	"	

6.2 LED ASS'Y

Symbol No.	Part No.	Part Name	Description
D101	PU47938	LED	
D102	PU44590	"	
D103	"	"	
	PU43351-104	Cap Housing	